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CHIPPENDALE FURNITURE.

Few workers have influenced their craft more than Thomas Chippendale, and few designers of furniture have secured so lasting a fame. This fame was honestly worked for and won, for not only did this master bring thoroughly good material and workmanship together, but he invested his productions with an originality and charm which, though said to have been borrowed from the French, gave to his designs a spirit of freshness all their own. Some of the furniture bearing his name is evidently due, from a careful study of his works, either to his sons or assistants, and with considerable reason it is thought that the singularly fantastic and over-elaborated looking glass frames, ceilings, and curious contemporary furniture, designed in a sort of Chinese manner, must have been due to his associates. It is undoubtedly true that Chippendale himself degenerated in his designs, as he became more known, and consequently more extensively engaged, and also when he endeavored, later in life, to produce works of still further originality. The faults we refer to are rather those of conception than of failings in mechanical execution, for in these particulars the most difficult tasks were undertaken and thoroughly well carried out. Frequently, indeed, these same difficulties, trying as they did the cabinet-maker's technical skill to the utmost, were the result of that struggling after novelty already alluded to.

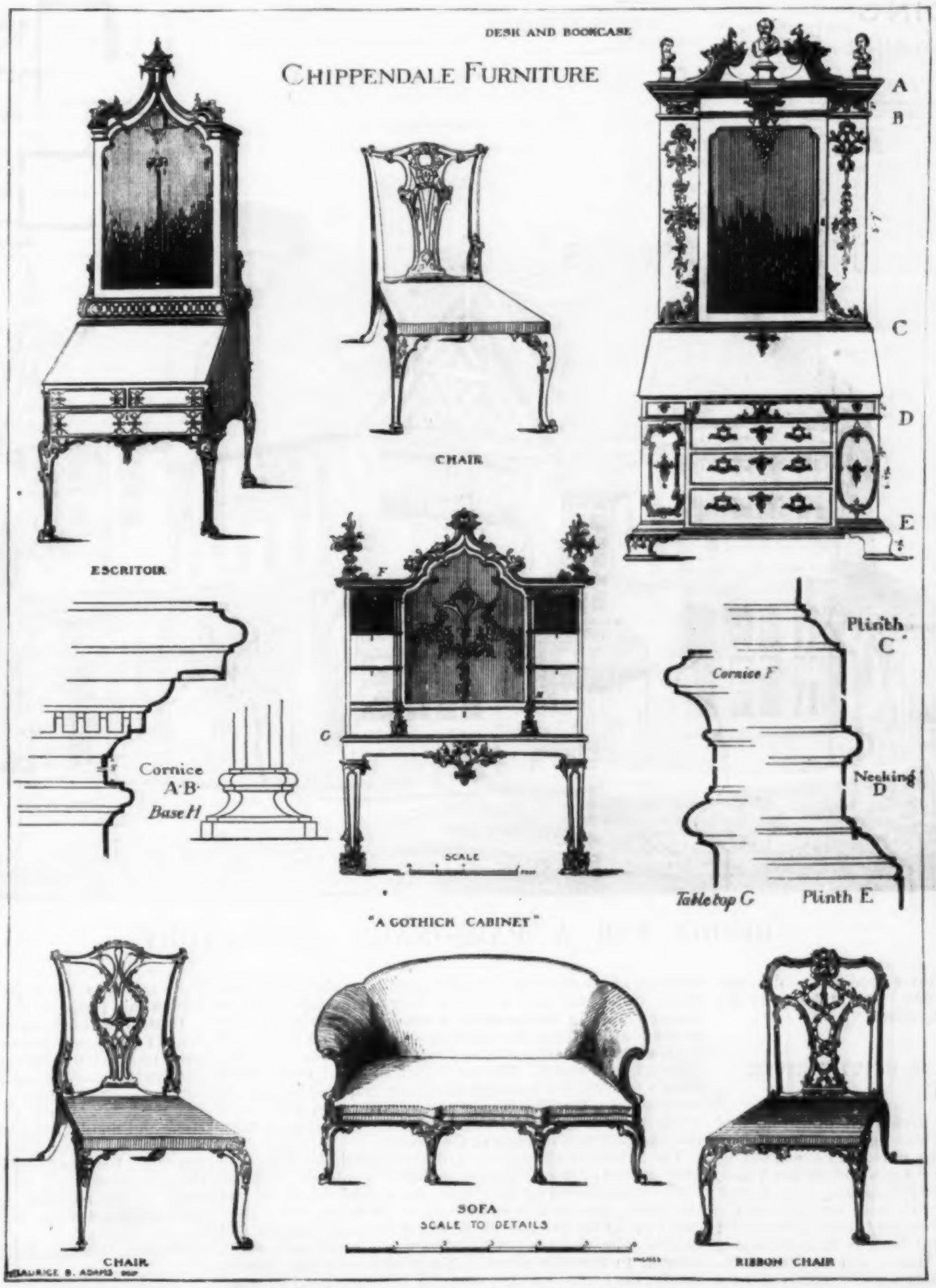
The drawings which we publish scarcely illustrate the diffuse character or extent of excess in this particular to which Chippendale's work was sometimes carried; but we propose to give specimens and further details, accompanied by sketches, not only of existing examples, but of modern pieces carried out in his style; such, for instance, as those for which Messrs. Wright & Mansfield, Messrs. Jenks & Wood, and others are so well known. The industry of Chippendale must have been most constant, and his designs, published in 1753, and again some ten years later, comprise almost every variety of work peculiar to his trade, while from unpublished drawings we know that, like furniture designers of most periods, he was extensively engaged on carriages and sometimes on organ cases.

Every form of movable furniture and cabinetwork he seems to have designed, as well as chimney fronts and interior decorations, but in these latter attempts he was by no means so happy, and evidences of help from French artists show that the limits of the master mind were occasionally overreached. The earliest turnings of taste toward the movement afterward known as the Gothic revival were at this time attracting attention, notably Horace Walpole's villa at Strawberry Hill (of which some time since we gave a detailed description), and Thomas Chippendale, influenced by the coming fashion, made some very strange attempts to master the spirit of the style, of which, indeed, he really, of course, knew nothing. In the center of our plate we reproduce an example, to scale, taken from one of the author's own drawings, with some of the mouldings enlarged. The center part of the upper body, with "Gothick pillars fixed on," is a door, and "hath a glass," intended to be silvered or left transparent, with ornamental sham tracery and carved swags, all executed in wood, extending over the surface, as indicated. The drawer below this door reaches the whole width, regardless of the scroll-like feet, which form fancy bases to the clustered columns before mentioned. These feet are carved out of the solid drawer-front. Two rather deep drawers occur on either hand of the central cupboard, and above are two double niches with open fret arches and plain turned dividing uprights.

The foliated and curve-shaped gable evidently was intended to secure a "Gothick" character; but the fussy excrescences at the ends of the cornice taking the forms of vases filled with flowers, "all a blowin' and all a-growin'," carries the work away into that class of meretricious design which has previously been noted. The legs are gracefully pierced with open ways, taking the form of a cross on plan; but the feet called "term feet" are only in keeping with the cornice enrichments. The exact profiles of the table-top, shaft-bases, and main cornice are drawn out large.

Turning now toward the more characteristic and really more representative designs of Chippendale's work which we illustrate herewith, the "desk with bookcase over" may be quoted as the most admirable example. Like the "Gothick" cabinet, it has a glazed central door, inclosing divisions for books, but a loss of space, available for ready use, is occasioned by the beautifully carved fronted bays on either hand. These, it will be observed in our drawing, furnish alternative patterns for the carver. The main cornice, surmounted by a carved and broken pediment, carries three sculptured busts, the larger of the series being in the center, and all playing an important part in the general composition. A detail of the cornice moulding is affixed with sections of the base and plinth mouldings.

The fall-down flap desk occupies the usual place, and below are two cupboards with shallow drawers over, and a chest of drawers in the center. All are elaborated with surface carving, executed in fine and sharp foliage out of solid dark mahogany, offering a surface as wear-resisting almost as iron. The several figured dimensions are given with the perspective diagram. On the other side of the plate we show an escritoire, bearing the date of 1760, and this is an unusual shape, and one seldom met with. A bookcase with silvered glass door commands the whole upper part, and measures 2 ft. 9 in. wide, 3 ft. 2 in. high, and 1 ft. 1⅛ in. deep. It is divided into two panels by a moulded shaft with cap and bases. The deep plinth-like moulding to this upper part is arranged in two halves as drawers, the joints being carefully ignored. The fall-down flap, as before, splays off and incloses the customary drawers and niches adaptable for writing purposes. Three drawers of useful size take their place in front, and the whole piece stands on shaped legs, rich with surface-carving, while a continuation of this work runs round the ornamental verge.



SUGGESTIONS IN DECORATIVE ART.—CHIPPENDALE FURNITURE.

Three chairs figure on our sheet, and to all alternatives of treatment are given at once, showing how soon Chippendale secured a variety of design by his facile power of ornamental design, though, indeed, so thoroughly did the author depend upon general elegance of outline and proportion for his effects, that he himself has left on record an old saying of his, that "should the small ornaments be thought superfluous, they may be left out without prejudice to the pattern." The heights of the backs generally measure 22 in. above the seats, which were mostly covered with curtain damask or woolen stuff, fixed down with brass-beaded nails. The maker, of course, preferred morocco fastened with brass borders neatly chased, or, as usually now done, ribbed at the angles with a piping of leather on cord.

The strength of these chairs, even with a hundred years' wear, is the best test possible of the extreme skill and care with which they were made, and the remark gains emphasis when the very light scantlings of the members are taken into account. The "Ribband" chair is a good typical specimen of its class. The sofa figuring in the middle of the bottom half of our engraving is smaller in scale than the chairs, but the sketch is amply large enough for the purposes of illustration. The ordinary size of Chippendale sofas, like all other lounges, is about 6 ft. to 9 ft. long, and the backs or elbows measure about 1 ft. 7 in. high. The depth of the seat is 2 to 3 ft., and the elevation of the seat is 1 ft. 2 in. besides the caster.

We hope to illustrate some of Chippendale's bedsteads and "courting-stools," but the sofa drawn herewith may be considered as a very fair specimen of his work. In larger sofas a cushion and pillar at each end were provided, and in smaller ones cushions behind resting on the back.

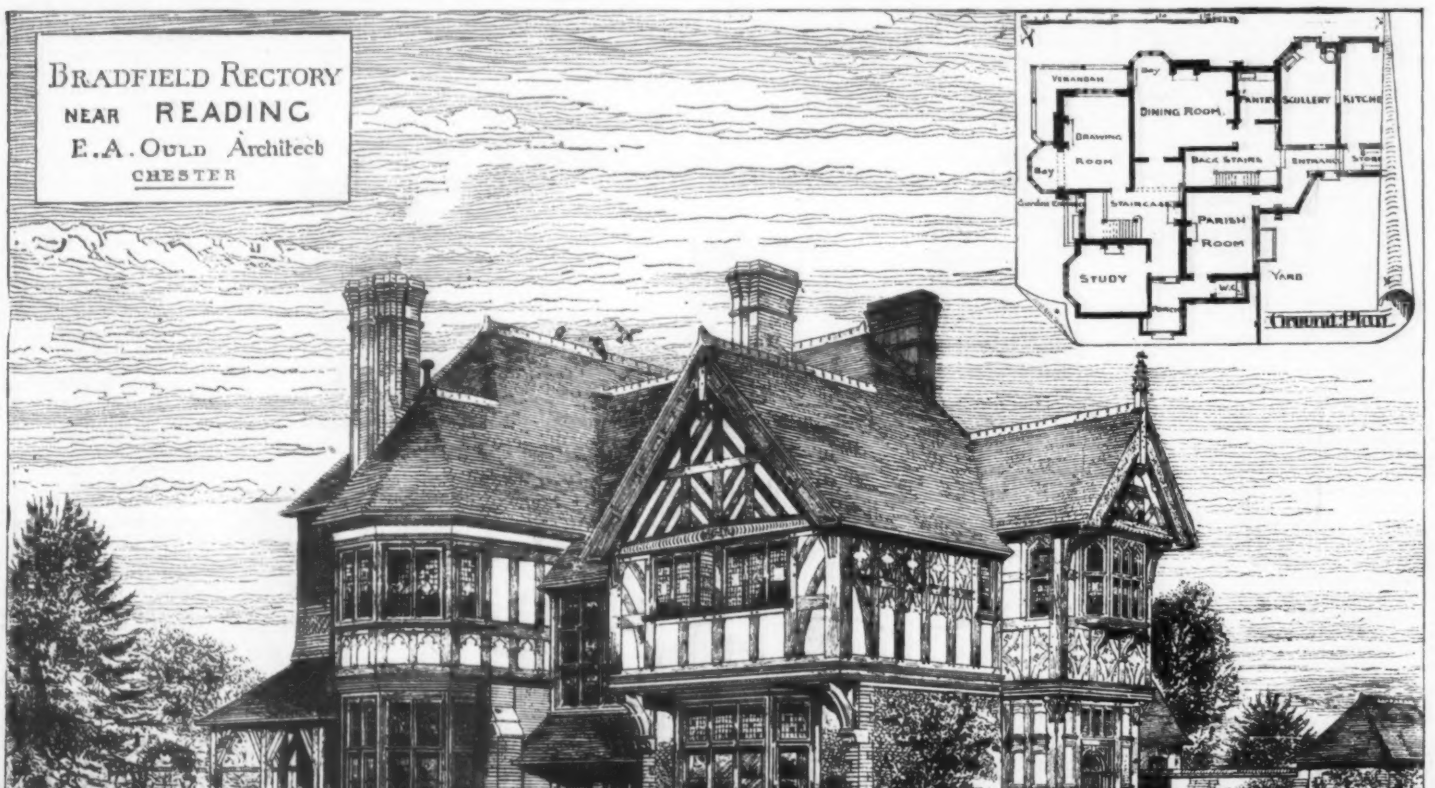
Originally a carver by trade, Chippendale often allowed his love of rococo fancy and redundant ornamentation to ignore the first principles of design necessary for the purposes of everyday furniture as well as for articles intended for simple uses; but he was seldom commonplace, and never vulgar.

To strictly copy or reproduce any of his designs now would serve to but little good purpose, though in many ways the type of design indicated by his work is clearly more in harmony with the spirit of modern domestic life and customs than the so-called Gothic furniture which not long since had its day. Curved shapes and retiring lines are surely better adapted for present wants than primitive square angles, however elaborated with the stop-chamber so dear in the days of Gothic revivalism.—*The Building News.*

Cucumber Wood.—There is a kind of timber known as "cucumber wood," which is used in some parts of Ohio for siding, and is regarded as good as any wood for that purpose. Considerable quantities of cucumber are cut on the Mississippi bottoms, where it is cut into dimension and made into boxes.

RECTORY NEAR READING.

This house is now in course of erection close to Bradfield College, at a distance of eight miles from Reading. It is being built partly upon the site of the old rectory which was pulled down, with the exception of the walls of the kitchen, scullery, and larders, which were reroofed and incorporated in the new building. The site is unusually advantageous, being on the side of a gentle slope, amid park-like ground and fine old timber, and surrounded by a large old-fashioned garden. The walls below are of snapped flints, so common in the neighborhood, "backed" with bricks, and with quoins, plinths, etc., of thin bricks from the Rowland Castle Brick Works, Havant. Above, the walls are for the most part timber-framed, with solid oak beams with cement panels, as is also the porch down to the plinth: but in some places the walls are hung with local red wall tiling. The chimneys and moulded bricks are from Mr. T. C. Edwards' works, Ruabon, and the roofs are covered with Broseley brindled tiles. Internally, the hall is laid with an oak-block pavement, and the staircase is of oak. The floors of the dining room and study are laid with dark oak boards from the old house, and the walls of the study are paneled with old oak framing up to the ceiling. Some curious grates and mantelpieces from the old house have also been reused. On the first floor there are six bedrooms, two dressing rooms, bathroom, etc., and in the attics three good servants' rooms. The entire cost will be about £3,200. The architect is Mr. E. A. Ould, of Chester.—*Building News.*



DESIGN FOR A PARSONAGE OR RECTORY.

THE FIRE-PROOF TOWNS OF THE RIVER PLATE.

It is curious that, while we have such disastrous and numerous fires in this and neighboring countries and in North America, there are modern cities and towns not far off absolutely fire-proof, as Buenos Ayres and Monte Video. In Buenos Ayres, a city of 300,000 inhabitants, a poor charwoman sleeps with her children with more safety from fire than the highest in our land. Even our beloved Princess of Wales and the royal children have been in danger from a fire taking place in Marlborough House, and the Prince being present first directed the children to be removed to a distant part of the house, and then ascending to where the fire was his Royal Highness fell over the joists of the attics and was hurt. Sandringham has also been on fire since the Prince purchased. Nor is our Queen safe, Windsor Castle having been nearly reduced to ashes in 1854, and her Majesty, Prince Albert, and the royal children staying there at the time; a valuable part of the palace was burned. Yet it is so easy to make houses fire-proof, using wood, not to speak of iron, that the older architects and builders of Buenos Ayres and other towns there probably never knew they are building fire-proof! They neither use iron nor the arch; but simply, that province being without trees, they have to use the hard woods from far up the river, which are dear, and so they use little, this being the whole secret.

A hundred walking-sticks may be placed 2½ inches from each other, and yet a fire cannot be made of them if they are spread gridiron-fashion, say, across two little walls of brick and a fire kindled below: it will burn through, say, four of the sticks which are in the flames, but there it ends. In the same way, if a wagon load of shavings and pieces of pine were provided, and half be packed under the best bed in a Buenos Ayres house, and the other half piled over it and set on fire, the bonfire would eventually burn through four or five of the hard wood joists above, and the bricks and tiles of the floor resting on same would fall through; but there it would end; the house could not be set on fire.

The houses are built as follows, the material being brick: Alike each floor and the roof (which is flat) are supported by joists of hard wood about the same distance apart as in this country; across these are laid flat rails of the same, and the spaces between these is bridged over by very thin bricks 13¾ inches long, their ends resting on the rails; another layer of bricks is then laid with lime, and generally on this a layer of tiles. The roof is exactly the same, but has a slope of about 1 in 30. Then the doors and windows have no boxes, but simply frames, which are set up on building the walls and built in. There is no lathing, nor wainscot, nor skirting of the bottom of the walls. And all the wood is of the hard and hardish kinds, slow to ignite. Thus the houses are, as already said, absolutely fire-proof.

The modern houses of Buenos Ayres are pretty much like those of London, Bath, or Edinburgh, nor would any one see much difference either outside or in. It would be easy therefore to adopt the same way of building here with the necessary slight modifications. The ends of the joists in the walls would probably rot in course of time from external damp penetrating, if they were not of wood indestructible from damp, like in the River Plate towns, where in the experience of the Spaniards, which extends to about two centuries, it does not rot. Hence if they were only of oak or perhaps teak in this country, a *battre* like a cornice should be built at the top of the walls of each story, on which the joists should rest, and so be sustained if their ends, built into the wall, ever rotted. The projection stuccoed over would form a cornice, being completed on the other walls, and be ornamental. But this is only necessary for men who would prefer wooden to iron joists. Why not prefer iron in this, the cheapest iron country in the world?

The lathing of the ceilings and walls should be done with iron instead of wood; narrow hoop-iron would do; and the slates be supported by sheet-iron, the drilling of which and the fixing the slates—perhaps by small screws and nuts—could surely be accomplished by our intelligent smiths and slaters. The heavy suspended slate would be the best, easily turning to the side as on a hinge when one gets broken. Lastly, the coldness of the floors could be obviated by being covered with thin boards of pine, or, better, black poplar, ¾ inch thick, and carpets above; but all the rest of the wood in the house to be of oak or teak, or other hard wood, both hard and wanting in that resin which makes pine so combustible.* The houses indicated could not be set on fire by a bonfire made in the best bedroom (but adhering otherwise to the River Plate plan, no boxing of or mouldings round doors or windows, no wainscoting or skirting of wood, but such being done with plaster, stucco, paint, gold and vermilion, if wished).

Instead of filling our houses with combustible pine, it would surely be better thus to copy the Spaniards in their fire-proof towns, Buenos Ayres, Monte Video, Rosario, Paraná, etc. No human lives lost there by fire, no priceless works of art! We not only make combustible private dwellings, but hospitals, infirmaries, lunatic asylums, sailors' homes, and the like, and the inmates are burned alive, or they are nearly killed by the bursting of the cistern on the roof, as in St. George's Hospital not long ago. The great lunatic asylum to the east of Glasgow, only finished a few years ago, was afterward on fire, and the managing staff were at their wits' end with the four hundred and odd lunatics within; but only the tower was consumed, which cost £1,000.* Lord Clyde returns from India, from the mutiny, and is nearly burned alive the first night he reaches a friend's mansion in the Highlands. A noble mansion is passed in the train in England, and some one says: "That is the Earl of ——'s, the new castle; the old one was burned down and the Dowager Countess was found a cinder;" and a Buenos Ayrean, a lover of nobility, who was listening, thought it strange that an Earl had not a house where his old mother would be safe! Theaters, halls, and churches are built combustible, exposing us to frightful risks. And the money losses are tremendous. Mills, factories, iron works even in the country where iron is so cheap, are built combustible, and are often burned up new in consequence.

And it is totally unnecessary! When the Theatre Royal of Edinburgh was burned the last time but one, when the Lord Dean of Guild and others perished, the Surrey Theater was destroyed the same way about a fortnight after, and the *Times* had a leader alluding to both, and saying that a theater need not have a particle of wood in it but the stage floor. Even this floor, the writer thinks, could easily be of iron with a thin lining of wood on it.

In the time of Shakespeare's father, architects and builders did not appear to know that houses could be built of stone or brick and lime alone. They knew that cathedrals and barons' castles could, but houses for gentlemen or linen-drapers must first have a frame of wooden beams—the gables like the letter A—and then the interstices be built in with stone and lime! Eventually all learned to build with stone or brick and lime, without the frame. In the same way we have now to learn to build without enough of wood to be capable of burning! For, finally, why should we be at the mercy of any madman, who with a penny box of matches could fire a dozen houses, theaters, infirmaries, and mansions?

T. G.

Mayfield Gardens, Edinburgh, Scotland.

* In Buenos Ayres they use carpets in winter, which are replaced by cool mats in summer. For greater warmth, however, and probably as now cheaper, some builders have latterly put in pine floors on the hard wood joists, instead of bricks and tiles, which is bad policy, and these new houses are not included when the writer states that the city is absolutely fire-proof.

* One of the Edinburgh asylums for the blind was also on fire some time ago.

PROGRESS OF THE PANAMA CANAL.

At a recent meeting of the American Society of Civil Engineers in this city, Mr. F. J. Cisneros, C.E., who recently visited the Isthmus of Panama, presented an informal statement of the progress of the work upon the Panama Ship Canal. He stated that the purchase of the Panama Railroad by the Canal Company seemed to promise most excellent results, and suggested that proper methods in the management of the railroad, and lower charges for both freight and passengers, would certainly increase its revenue.

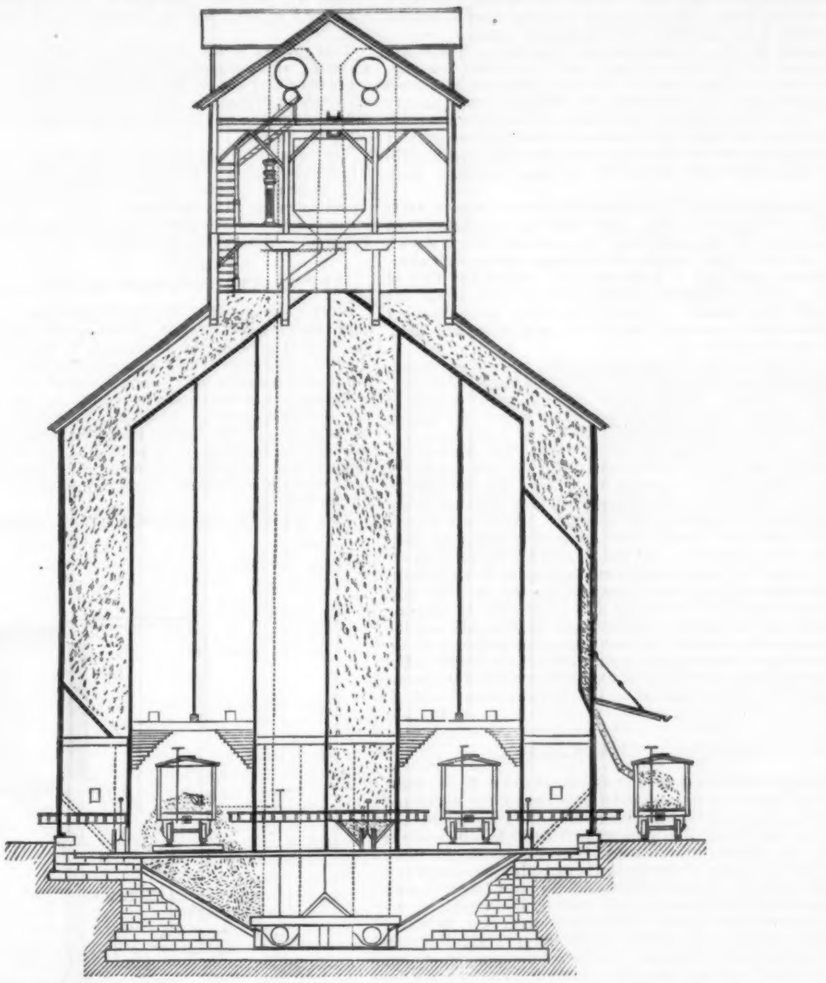
In reference to the canal, he said that the line had been completely staked, cross sections taken, and the location made and stakes set for definite work for a large portion of the line. The line is entirely cleared and grubbed from kilometer 40 to the mouth of the Rio Grande, and is rapidly advancing at other points. The valley of the Chagres has been surveyed, and it has been found that the high water lines above the high dam will cover an area of about 6,750 acres, and that the volume of water stored will be about

THE WATSON PLAN OF GRAIN ELEVATOR.

THE improved grain elevators designed by William Watson are built as follows:

After excavating the ground to the proper depth for the sinks, the entire surface is covered with eighteen inches, or more, of concrete. On this heavy footing courses are laid, and the sink walls are carried up to within about four feet of the top of the ground. The main walls of the building, on heavy footing courses, are then put in, as shown by the drawing, and brought to the proper level to receive the foundation timbers for cribwork. When the nature of the ground requires it, piling is put in, which, being sawed off level, is covered with heavy planking to form a solid foundation for concrete and footing courses.

This construction of foundation lessens the liability of the building to settle unevenly, as when resting on piers. These walls average eleven feet from centers, each way of the building. The foundation timbers rest full length along these walls. Upon these the cribwork commences, and is carried up to a height where the brackets are projected to support the timbers over the passage ways. Hopper bottoms are put in the bins, each side of the sinks, as the work progresses. When the timbers are placed over the passage ways, bottoms are put into the bins which are supported by these. The walls of the bins are carried to the eaves of main roof, where the two outer walls on each side stop. The cross walls are continued, stepping off the slope of the roof.



END VIEW OF THE WATSON GRAIN ELEVATOR. (Capacity, 1,000,000 Bushels.)

The middle walls are carried up a few feet higher, when the sills of the cupola are put in, running lengthwise the full length of the building. The first story of the cupola is then raised. The walls of the cribwork are continued four to six feet above these sills. Bottoms made of the same material as the cribwork, placed on edge, run from the highest point of cribwork, and middle of building to top of inner wall of first row of bins. Openings are left in these bottoms, and cross walls so placed that the mouth of each and every bin is brought up to the mouth of the revolving spout; thus dispensing with every foot of spouting in the top of elevator. The balance of the cupola is then finished. The tops of the bins have a tight flooring over them. Hopper scales are placed in a row through the middle of the building on the second floor, one on each side of elevator leg. Under each scale hopper a heavy wrought-iron revolving spout is placed, reaching to round holes cut in the floor over the mouths of the bins, through which the grain passes directly into the bins. This revolving spout is so arranged that the weighman can raise it out of and set it into any of these holes without moving from his place on the upper floor, or spilling a single grain. A framework of heavy timber is placed in each sink, forming a support for the boxing that surrounds the elevator belt. This boxing extends to under side of timbers over passage way, commences again on first floor of cupola, and extends to the top of building. This boxing is formed by inclosing the up and down belt of the elevator leg in the same space, instead of having a box for the up and one for the down belt, as usual. This prevents all possibility of the belt dragging on the front or back of the leg. In all elevators, two points must be provided for, viz.: The settling of the cribwork, and the settling of the shafting and other machinery. Having no trunking, no line shafting, but having an adjustable foundation to the engine and head of elevator, no other provision is necessary. This is a point of great saving in cost of building. A small bin is provided between the upper and lower sections of the boxing through which the elevator belt passes. No bracing at all in these legs. Instead of one large engine with main driving belt and long line shafting in top of building, with necessary gearing to start or stop one or more legs, one small engine is placed at head of each leg, and direct communication made with head pulley. These engines are set upon an adjustable foundation. The post for the bridge-trees of the elevator rest on the same foundation. Thus all machinery may be kept in line. The engines are under control of the weighman, who can start or stop them without leaving his place. Steam is carried to these engines through pipes from the boiler-house, which may be located at any convenient point. Openings with flap doors near the bottom of each bin do away with ladder rods. These openings cannot be put in on any other plan. The bins are all hoppered to discharge contents into the sinks without the use of spouts, ropes, or levers. A drag-belt is placed full length of the building and over the top of the scale hoppers, into which all elevator legs can be discharged on either top or bottom strand, conveying grain in any desired direction to the scale hoppers. This drag-belt is driven at either end of building, from the head of elevator. The spaces for cars or wagons run lengthwise of the building. The floors of these passage ways are on a level with the car floor, with a space between sufficient for workmen to pass. This open floorway, with no line of posts, full length of the house, greatly facilitates the shifting of the cars and the opening of the doors. The cross passage ways are floored on same level; these floors afford ample room for operating the house. Iron rods attached to the slide, covering the mouth of the bins, pass up through the floor near the walls. A ratchet holds the gate or slide. This house has been planned especially for the rapid and economical handling of grain. An elevator built on the Watson plan, occupying the same area on the ground, and having the same storage capacity as one on the general plan, is fully one-third less in size, and accomplishes in a superior manner all that can be done in the old plan.

DESCRIPTION OF MEMPHIS GRAIN AND PACKAGE ELEVATOR.

These buildings, erected by Mr. Watson, are situated at Center Landing, Memphis, Tenn. The package elevator or warehouse is for receiving and storing all classes of freight handled by boats and cars.

The building is one of, if not the largest of its kind, in the United States, occupying three hundred feet by three hundred and seventy-five feet.

The river front of the building is four stories high, the part next the track one story, giving a floor surface of more than 225,000 feet superficial. To facilitate the unloading of steamboats, three package or freight legs are used, reaching from the main or receiving floor to the boats. These legs are wrought iron trestles, seventy-five feet long. The upper end rests on a carriage which travels backward and forward as the outer end is raised or lowered to provide for the rise and fall of the water. This outer end is lowered and raised by iron blocks and chains. Two small engines, at the head of each leg, furnish the power, which runs an endless chain on which cleats are bolted.

Three shorter legs run from the main floor to the upper or storage floor. Teams pass through on all the different floors.

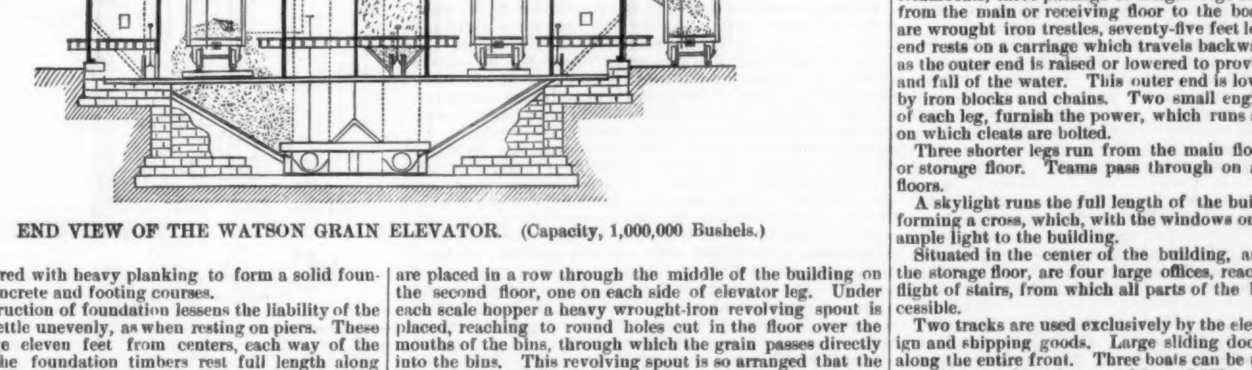
A skylight runs the full length of the building each way, forming a cross, which, with the windows on the sides, gives ample light to the building.

Situated in the center of the building, and raised above the storage floor, are four large offices, reached by a double flight of stairs, from which all parts of the building are accessible.

Two tracks are used exclusively by the elevator for receivign and shipping goods. Large sliding doors are provided along the entire front. Three boats can be unloading at the same time, each at the rate of from 3,000 to 6,000 packages an hour. Provision is also made for loading and unloading stock at any stage of water.

The grain elevator being run in connection with the warehouse, has many parts in common with it. It occupies a space 60 feet by 150 feet, and is 250 feet from the river front of the warehouse.

It is built on the Watson plan, of which a description may be found on page 4 of this pamphlet. Three dock or



MEMPHIS GRAIN AND PACKAGE ELEVATOR.

canal legs are placed on the river front. These differ from anything in use in the country, requiring a great deal less machinery and less elevation of the gain. Three drag belts convey the grain a distance of 275 feet, and discharge it into the sinks of the elevator, whence it is elevated, weighed, and spouted into the bins.

Six shipping bins and loading spouts are provided on the railroad side of the building for loading grain into cars.

There are also a number of spouts for sacking and for loading into wagons. Two 100 H. P. steel boilers, and a 100 H. P. engine furnish the motive power for the grain elevator and drag belts. Three small engines run the dock legs. Besides these engines nine other small engines are used in running the freight legs, and one hoisting engine for various purposes.

Pipes from the two boilers convey steam to all these engines.

Waterpipes running through the building supply water to 32 fire plugs, with ample hose attached. Slate roof covers the grain elevator, gravel the warehouse, and the sides of the entire structure are covered with corrugated iron.

SWIFT OCEAN STEAMSHIPS.

When the little steamship Savannah steered boldly out into the Atlantic, in May, 1819, her speed was not so much thought of as the question whether she would ever get over at all. She made the passage from Savannah to Liverpool in twenty-two days and returned in twenty-five days in November of the same year. This round voyage solved the experiment of steam ocean navigation, and from that time until to-day there have been regular cycles, or periods, in the increase of the speed of steamers, as well as in the particulars of size, comfort, and luxury. It was not, however, until early in the fifties that particular attention was given to the increase of speed. Travelers who had been accustomed to the time of our fast American sailing packets viewed a fifteen to eighteen days' trip by steamer as an excellent one. But this was changed when the hot rivalry between the Collins and Cunard steamship lines began, and the Collins line went to cutting down time at a rate which attracted world-wide attention. Thirteen and then twelve day passages began to be common. The American line put on the superb steamship Adriatic as the last of a fleet of fliers, and the Cunarders followed suit with the Persia and others, and between them the time was reduced to inside of eleven days for regular passages. These were all side-wheel steamers, and, burning an enormous amount of coal, were unable to carry much freight, so special attention was given to the care of cabin passengers, emigrants still sticking to the sailing vessels.

The loss of the Arctic and Pacific, and other misfortunes, in a few years drove the popular Collins line out of existence. But not before the Adriatic had shaded a ten-day passage considerably. English steamship lines from that time out had it all their own way until other nations began going to the Clyde to build ships with which to start lines of their own. By 1861 the old paddle-wheel steamers had generally given place to screw propellers, the fleet of which has since then been gradually enlarged to its present proportions.

All this time English ship builders have not been idle, but very progressive and eager to seize on any improvement that would increase the speed of steamers. American inventors have not been idle either, and in fact the most important improvements and inventions in iron steamers have been made by Americans, though we have not an American-built steamer in the Atlantic trade. For many years ten days continued to be a good average fast passage, but new lines starting to compete in passenger and freight traffic began to rival and surpass the older lines by regularly cutting down the ten-day trips, until by 1875 eight day trips began to be common. The White Star line was conspicuous for several years in this respect, though now as a longer route is taken the passages are not so quick. In 1876 the White Star steamer Britannic made six outward trips, averaging 7 days 18 hours 26 minutes, the homeward passages averaging 7 days 20 hours 56 minutes. The fastest trips of the vessels of this line are as follows: Germanic, 7: 11: 37; Britannic, 7: 10: 53; both made outward in 1877. In 1879 the Celtic made an outward passage in 8: 4: 25, and the Baltic in 8: 0: 6. The Republic made an outward passage in 1881 in 8: 1: 20. The fastest average of fifty-four outward voyages made by the Britannic since 1876 is 8: 7: 17, the average homeward time being 8: 3: 22.

About the same time the Inman line steamers were making some quick trips. The City of Richmond made an outward trip in 1875 in 8: 0: 12; the Berlin in 1877 in 7: 14: 12; the Chester in 1878 in 8: 3: 40; and the Brussels in the same year in 8: 1: 39. The Berlin made seven passages outward in 1875, averaging 8: 10: 56. The averages of the Richmond for several years were also under nine days.

The fastest passage ever made by any steamer of the National line was made outward by the Spain in 1872, in eight days and thirteen hours. The Egypt has also made several trips under nine days. The line does not claim, however, to make any better than regular steady nine-day trips to Liverpool at present.

The Cunard line, French line, North German Lloyd's line, and others also had vessels which made some exceptionally quick trips between 1875 and 1880, but this period may be set down as the nine-day period, though, as shown above, the average of the voyages of several crack ships during that time was considerably under nine days.

The Arizona of the Williams & Guion line astonished everybody by cutting under the fastest time on record in September, 1881, when she made the voyage this way in 7 days 8 hours 32 minutes. The next month she eclipsed this performance, making the run homeward in 7 days 7 hours 48 minutes, the fastest trip she has yet succeeded in making. A year later, however, the Alaska of the same line surpassed even this remarkable feat, making the homeward voyage in 6 days 18 hours 37 minutes, and this stands to-day as the fastest on record. A recent trip was almost as quick. She sailed April 29 and arrived here May 6, making the voyage in 5 days 23 hours 46 minutes. The best daily run of the Alaska was 447 knots, made in November, 1882.

But the new steamer Oregon of the same line, which will be here in August, is expected to outstrip in speed even the Greyhound of the Atlantic, as the Alaska is called. She is being built on the Clyde, by John Elder & Son, who also built the Arizona and Alaska. The Oregon will be 520 feet long, 54 feet beam, and have engines of 13,000 indicated horse power, 2,000 more than the Alaska. She will have 72 furnaces, and 9 boilers, engines of the usual type, three inverted cylinders, and high-pressure 70 inches, and two low-pressure 104 inches diameter, and will be of about 9,000 tons gross tonnage.

Of course other lines have had to follow suit in the direction of speed, and several are striving after six-day boats. The new steamer Normandie of the French line arrived here May 13 on her first trip, having made the run from Havre, 3,200 miles, in 8 days 16 hours. The Alaska led her by about a mile and a quarter an hour in average speed, but the Normandie is expected to do much better when the newness is worn off the machinery. It must be remembered, in making comparisons, that the French steamers have a course about 360 miles longer than the Liverpool steamers. The Elba of the Bremen line made the trip of 3,173 miles from the Needles recently in 8 days 7 hours 45 minutes. The City of Rome of the Anchor line has received additional boilers and more powerful engines, and on her recent speed trials is reported to have made 63 revolutions and attained a speed of 18½ knots. If so, she can beat the Alaska, but the speed trials were probably made in smooth water.

Thomson & Co., of Glasgow, are building a new 6,500-ton steamer for the National line. She is to be 430 feet long, 51 feet beam, and built entirely of steel. She will be named the America, and it is predicted she will turn out a six-day boat. The Egypt, Spain, and Italy of this line have all good models, but their engines are not powerful enough. It is contemplated to take them one at a time and put in additional boilers and more powerful engines to increase their speed.

The Cunard line has at present a flier in the Servia, built of steel at Glasgow in 1881. She beat the Arizona's time not long ago on the eastward trip, making it in 7 days 5 hours, but has never beaten the Arizona going westward. The Inman line has a 6,000-ton ship, called the City of Chicago, nearly completed, which will be here about the middle of the summer. It is thought that before another year passes one or more of these new crack ships will inaugurate the six-day period.

The five-day epoch is regarded as being yet rather remote, but steamship men consider it by no means improbable that, with the continual improvement in mechanical science, a five-day passage will be made ere many years. Of course increase of speed means increase in size, in consumption of coal, and consequent increase of expense. The Oregon will burn nearly 300 tons of coal a day. The old iron steamer of 2,500 to 3,000 tons is changed to a steel one of 6,000 to 9,000 tons. The coastwise steamers we now have are larger than the old transatlantic side-wheelers. Very fast American built steamers, mostly iron, are now engaged in trade between Northern ports, and the improvements in them are equal to those in the steamships engaged in the foreign trade. On both sides of the Atlantic busy brains are at work constantly devising new inventions and appliances to increase speed as well as safety, comfort, and luxury, and any improvement soon becomes general under the pressure of the great rivalry in ocean passenger and freight traffic. For this reason, there is little radical difference to be seen among the first-class ocean steamships of the present day.—*N. Y. Sun.*

SEWAGE AND SEWERAGE.

The report of Mr. James T. Gardiner to the N. Y. State Board of Health on the methods of sewerage for cities and large villages is a most valuable and interesting document. Mr. Gardiner begins with an unqualified condemnation of the system of privy-vaults and cess-pools; pronounces "dry removal" by means of earth-closets or pails to be much better, but open to serious objections, as requiring constant vigilance and intelligence on the part of householders; declares the ordinary method of combined sewerage, in which both the sewage proper and the much larger body of storm-water are conveyed together in subterranean sewers to be, from the sanitary stand-point, a failure; and finally praises as the best plan yet devised, the separate sewerage, by which *excreta*, slops, and waste-water are removed through mains, while storm-water is provided with separate conduits of large dimensions, or led off on the surface to natural channels of outflow. The most perfect example of this system is found in the sewerage of the city of Memphis, designed by Col. George E. Waring, the eminent sanitary engineer, and operated since 1880 with complete success. Mr. Gardiner quotes at length from a report of Mr. C. H. Latrobe, who examined the Memphis system for the city of Baltimore.

The most striking points of Mr. Gardiner's paper are these:

1. There is probably no such thing as a poisonous "sewer-gas," to which the diseases caused by the admission of sewer air into dwellings may be ascribed. No proof exists that ammonia, sulphureted hydrogen, or any other gaseous products of organic decomposition, do or can cause zymotic diseases. On the contrary there is much evidence going to show that these diseases are produced, according to the so-called "germ theory," by *bacteria*, the germs of which are developed in the sewer-air under the favoring conditions of heat, moisture, darkness, and the presence of ammonia, and growing thus on the damp walls of sewers, may float off and be borne like dust on the atmospheric currents.

The reader's first impression may be that this is a distinction of little practical importance. What difference does it make to the victim of bad plumbing to be told that he is poisoned, not by the gas from the sewer, but by germs in the gas from the sewer? The practical difference to the moribund victim may indeed be nothing; but it is highly important to prudent people, not yet about to die, and to sanitary engineers. For it follows, first, that the odor of sewer-gas, though a useful warning of its presence, is not a measure of its poisonous character. A slight odor, given by air from a large and ventilated sewer, may accompany the maximum proportion of *bacteria*. Again, since damp exposed sewer-walls favor the multiplication of these low organisms, it is evident that large brick sewers, which run full in a heavy rain, and half full or nearly empty at other times, are the worst that can be used for this purpose, and not the best, as many engineers have supposed, and as indeed would be the case, if the dilution of the sewer-gas with the air were an efficient means of rendering it harmless.

2. The large sewers have been adopted for this reason partly, and partly because they were required to convey sudden accumulations of storm-water, and it was thought a good thing to combine the two things, and secure a periodical natural flushing of the sewers. But it now appears that the best possible conduit for *excreta*, grease, and waste-water would be one exposing a minimum interior surface, and also permitting, by its small size, the use of enamel on that surface. This smooth material is easily kept clean, and the conditions for the growth of *bacteria* along the walls are greatly diminished or destroyed.

3. But such small sewer-mains would be totally inadequate to carry the storm-water, which is, during violent rains, nearly fifty times the ordinary sewage. Hence the necessity of a separate disposal of the storm-water. For the great majority of towns, no sewers would be needed for this purpose. The clean storm-water could be left to flow away to natural channels, as it does in the open country. In such cases, the cost of the small sewer-system would be from one-fifth to one-third only of that involved in the combined system. The estimates for the latter type in Memphis ranged from $800,000 to $2,225,000; the actual cost of the separate system was $137,000. For towns which require short storm-water sewers to lead the rain-fall to natural channels, the expense would still be generally less than that of the extended and comprehensive combined sewerage. Finally, there are, no doubt, a few large cities, where complete underground systems of storm-water drainage are required. In these cases, the expense of a completed double system will be about one quarter greater than that of the combined system; but the sanitary gain will be worth its cost.

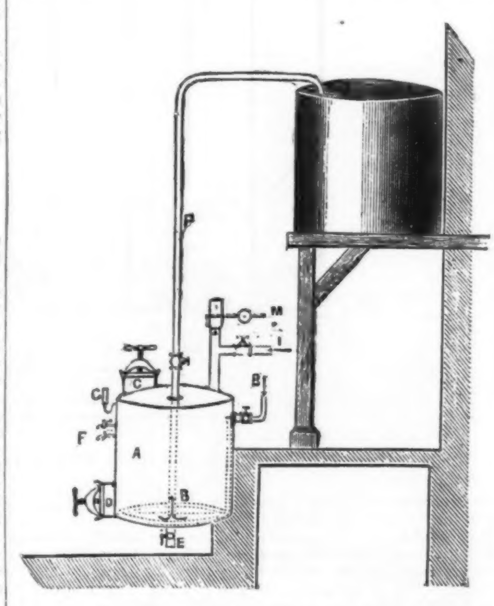
This subject is one of great and growing importance to all cities, and particularly to those which are beginning to organize water-supply and drainage. They will find great economy in beginning right; and the light which modern sanitary science has thrown on the subject comes none too early for them.

The articles on the sanitary condition of New York, contributed by Colonel Waring, some months ago, to the *Century Magazine*, should not be overlooked in this connection. Together with Mr. Gardiner's paper, they contain more "solid sense" on the subject of sewerage than many bulky volumes.—*Engineering and Mining Journal.*

APPARATUS FOR EXTRACTING LOGWOOD.

Some time ago, says *The Textile Manufacturer*, our valued contemporary *Das Deutsche Wollengewerbe* offered a prize for the best treatise on the treatment of wool in washing and dyeing. The essay which obtained this prize was written by a practical manufacturer, and contained among other things a description of the apparatus which he used for obtaining his logwood extract. This latter seems to have attracted the attention of the woolen manufacturers in Germany, and has induced the author to publish a more minute description; and as the matter seems to be of general interest, we have thought it advisable to reproduce it here for the benefit of our readers.

The apparatus consists of a vertical, cylindrical iron vessel, which may be a boiler in sound condition cut down, but is best made of new plates. B is a steam-pipe, which admits the required steam from a boiler, and terminates inside the extracting keir in a circular perforated pipe placed along the sides and just over a false bottom. In the top of the boiler there is a manhole, C, closed in the usual way by a lid. At the lower end a similar manhole and lid is situated in the side of the keir for removing the spent wood. In the bottom a tap, E, is inserted for removing the water which is admitted for cleaning the vessel. At a certain height two testing cocks, F, are placed for examining the height and condition of the liquor and water. The usual steam gauge is shown at G. The water-pipe for filling the keir is marked I, and the weighted lever safety valve, M. Down the center of the keir a pipe, P, descends nearly to the bottom and ascends upward, terminating in a receiver situated at an elevation, and collects the extract which has been made. This receiver can be made in any convenient manner but an old boiler is the best, and it is most suitable to have it higher than its width. Having now described the arrangement, which it will be seen is very simple, we will proceed to explain the manner of using it.



When the required quantity of ground or chipped logwood has been placed in the keir, the tap at the bottom is closed, also the one in the ascending pipe, and the two testing cocks and the tap in the waterpipe are opened. As soon as the first drops of water appear at the lower testing cock, this and the water tap are closed, and then steam is admitted through the pipe, B. The upper test cock remains open until all atmospheric air has been expelled, and is closed when steam passes out. After a little while the steam gauge will begin to show an increase of pressure. As soon as this has risen to 20 or 22 lb., it is necessary to open the tap in the central vertical pipe. The admission of steam is continued until the gauge shows about 37 lb. pressure, and the safety valve must be set to blow off at this pressure. Experience has proved that 37 lb. is the highest pressure which is of advantage, as already at 45 lb. the extract loses its clearness, and forms a muddy liquid which is useless for dyeing. The steam-pipe must now be closed, when the steam will force the extract up the vertical pipe and into the receiver. This action is described as being so perfect that the last drop of extract is lifted out of the keir, and lastly will be followed by the steam itself. A pressure of 37 lb. suffices for lifting the liquor to a height of 80 feet. This operation of extracting must be repeated three times with the same lot of wood. Each time the keir must be filled with water, as before. The three decoctions, which differ materially from each

other, unite then in the receiver to one liquid, which thus becomes always of one strength. If the receiver is placed high enough, it will be easy to conduct the extract, by its own gravity, by means of pipes to the different dyebecks, where it can at any time be turned on by a tap, thus avoiding the trouble of having to carry it about in buckets.

Another important item is the position of the extracting keir, for by attending to this much labor may also be saved. The best place for this is on the ground floor. The storeroom for the ground wood should be on the floor above, which is more advantageous than if in a cellar. An opening should then be made in the floor above, and a hopper placed over the keir. The ground wood should be shoveled into a box with wheels, the latter then run over the hopper, one side removed (either sliding or on hinges), when the wood will descend without any trouble into the kier. This box should be of a given size, so as to hold a given weight of wood of a certain standard dampness, say one-fifth part of a filling of the keir; and when putting the wood into this box it should be stroked off level with the top of the box, which will always give the same weight of wood, for practice has proved that however much the dampness of the wood may vary this does not affect its volume.

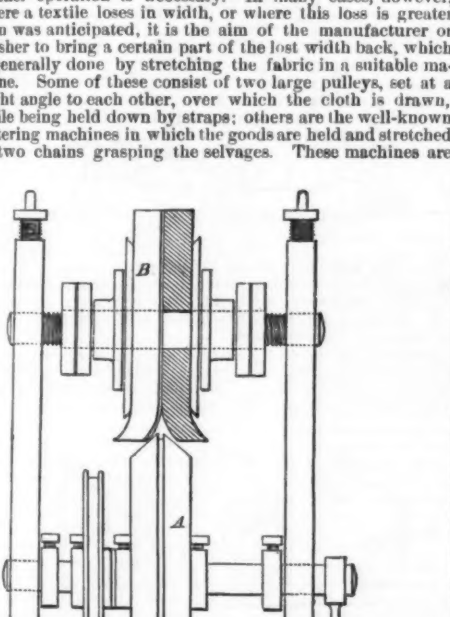
We have said before that the receiver should be rather higher than its width. This is of special advantage for indicating the quantity of liquor to be drawn off each time. For this purpose a zinc tube of about 4 inches diameter should run from the bottom to the top of the receiver. In this tube there should be a float, made in the shape of a small zinc closed cylinder. This float is then connected by means of a cord running over a pulley, with an index finger hanging over a graduated board placed in front of the receiver. The greater the height of the receiver is in proportion to its width, the greater will be the vertical displacement of a given quantity of liquor and the plainer the indication on the board. In this manner the quantities to be drawn off for each dyebeck can be regulated to a nicety.

To make calculations as to the quantity of wood to be used, it is best to measure exactly the height of the liquor in the receiver when the three decoctions have been mixed. This height then represents the weight of wood which has been used. By dividing one by the other the scale on the board can be so graduated that each line represents, say, 1 lb. or ½ lb. of wood, on any other given quantity.

We have here given the principal features of this arrangement, but every dyer will be able to alter them to his convenience. Thus it may be suitable to place the keir and the wood stove near the boiler-house, in order to have the steam near, and also to be able to run the spent wood easily to the boiler or any other position which may offer advantages; but on the whole it will be found that this apparatus for extracting the wood offers many advantages, and is not costly.

STRETCHING MACHINE FOR RIBBONS AND TAPES.

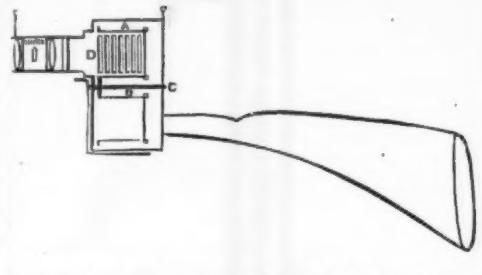
ALL textiles, whether narrow or wide, are liable to run in the direction of their width during the process of finishing, especially where this is done on the endless system. This may in some instances be allowed for in weaving, when no further operation is necessary. In many cases, however, where a textile loses in width, or where this loss is greater than was anticipated, it is the aim of the manufacturer or finisher to bring a certain part of the lost width back, which is generally done by stretching the fabric in a suitable machine. Some of these consist of two large pulleys, set at a slight angle to each other, over which the cloth is drawn, while being held down by straps; others are the well-known tentering machines in which the goods are held and stretched by two chains grasping the selvages. These machines are



only suitable for piece goods of a certain width, and cannot be applied to what are called small wares. These latter are, however, liable to run in the same way as wider textiles, though in a smaller degree. In order to bring them back a certain extent to their original width, a German manufacturer in the neighborhood which supplies nearly all the world with hat-bands and other tapes, has invented a small machine which may be of interest to some of our readers. It consists in the main of a frame carrying two superposed pairs of disks running on short shafts. The lower one, A, consists of two halves, with beveled edges, which can be set closer or further apart by two set screws. Above these revolves another pair of disks, B, whose inner edges are turned outward and fit on the corner edges of the lower disks. These two can also be set by lock-nuts on their shaft. A pair of screws passing through the frame produces the pressure of one pair of disks upon the other. The tapes, laces, or other small wares to be treated are passed between these two pairs of disks, whose distance and pressure are regulated according to wants. The convex and cone and surfaces between which the goods pass will then have a tendency to stretch them in the direction of the weft, and to do this uiformly and evenly. The upper disks are made of vulcanized India-rubber, which thus acts as a soothing medium, and, so to speak, rubs the fabric out. The little machine can be turned by hand or by a pulley.—*Textile Manufacturer.*

THE SANDS GUN CAMERA.

THIS apparatus is intended to secure photographs of rapidly moving objects. It is provided with a gun-stock, and front and back sights, so as to be capable of being "aimed" with precision. A little stud in front permits the adjustment of focus—approximately only, of course—prior to raising the gun camera to the shoulder. Eighteen plates may be put into the apparatus, the plates being small disks of glass about the size of an ordinary eye-glass. Behind the tube containing the lens there is a large disk plate, bearing three brass cylinders. One contains the unexposed plates, the other is to receive them as they are exposed, and the third is



an intermediate receptacle, and, is, indeed, the back of the actual camera, for it is always in position when the exposure takes place. Each sensitive plate is borne in a rim or frame to prevent the surfaces touching—looking like rimmed eye-glasses—and they are kept pressed forward by a spiral spring behind. The working of the apparatus may be imagined. The cylinder containing the plates is turned, so that one plate enters the tube, behind the lens; the intermediate cylinder then takes the place of the plate cylinder, and after exposure, which is accomplished by a revolving shutter, the plate is received into cylinder No. 3.

ANTISEPTIC SUBSTANCES.

UNTIL the gelatino-bromide process came into general use, the general photographer had but little to do with such organic bodies as are subject to rapid putrescence. Albumen is certainly very liable to decomposition, but, as a rule, it is salted and dried before it comes into the hands of the photographic practitioner. Things are altogether different in the present day, and any advance in our knowledge regarding the action of antiseptics becomes of especial importance from a photographic point of view.

Miquel has recently published a memoir on antiseptic substances and their action, and his results will be studied with interest by all gelatino-bromide workers.

Antiseptic bodies are roughly classified as follows:

1st. "Generally antiseptic" bodies, of which from 0·01 gramme to 0·10 gramme suffices to preserve one liter of broth from putrefaction. This class includes peroxide of hydrogen and bichloride of mercury. 2d class. "Very powerful antiseptics," or bodies of which from 0·10 gramme to 1·0 gramme is required to preserve one liter of broth. Iodine, chloride of gold, tetrachloride of platinum, hydrocyanic (prussic) acid, and bromine come under this heading. 3d class. "Powerful antiseptics," of which from 1·0 to 5·0 grammes are required. Chloroform, potassium bichromate, ammonia, thymol, phenol, permanganate of potassium, nitrate of lead, alum. 4th class. "Moderately antiseptic bodies," from 5 to 20 grammes being required. Hydrobromate of quinine, white arsenic, sulphate of strychnia, boric acid, arsenite of soda, hydrate of chloral, salicylate of soda, caustic soda. 5th class. "Slightly antiseptic substances," from 20 to 100 grammes being required to preserve the liter of broth. Borate of soda, hydrochlorate of morphia, alcohol. 6th class, or "Very slightly antiseptic substances," includes those bodies, of which from 100 grammes to 300 grammes are required; and under this heading M. Miquel mentions iodide of potassium, common salt, glycerine, ammonium sulphate, and sodium hyposulphite. Substances such as sugar, which must be present in a much larger proportion in order to exercise a preservative action, are placed outside the category of antiseptics.

Bacterial germs and adult bacteria were added to broth, and it was found by experiment that the following quantities of the various antiseptic substances added to one liter served to prevent the rejuvenescence of the bacterial organisms:

Class 1.

Peroxide of hydrogen	0·5 gramme.
Bichloride of mercury	0·7 "

Class 2.

Iodine	0·25 gramme.
Chloride of gold	0·25 "
Tetrachloride of platinum	0·30 "
Hydrocyanic acid	0·40 "
Bromine	0·60 "

Class 3.

Chloroform	1·0 to 2·0 grammes.
Potassium bichromate	1·2 "
Ammonia	1·4 "
Thymol	2·0 "
Phenol	3·2 "
Permanganate of potassium	3·5 "
Nitrate of lead	3·6 "
Alum	4·5 "

Class 4.

Hydrobromate of quinine	5·5 grammes.
White arsenic	6·0 "
Sulphate of strychnia	7·0 "
Boric acid	7·5 "
Arsenite of sodium	9·0 "
Hydrate of chloral	9·3 "
Salicylate of soda	10·0 "
Caustic soda	18·0 "

Class 5.

Borate of soda	70·0 grammes.
Hydrochlorate of morphia	75·0 "
Alcohol	95·0 "

Class 6.

Iodide of potassium	150·0 grammes.
Common salt	165·0 "
Glycerine	225·0 "
Sulphate of ammonia	250·0 "
Hyposulphite of soda	275·0 "

Some sodium salts—as, for example, the sulphate—are remarkably inefficient, a dose of 500 grammes being insufficient to prevent the germination of the bacteria. It may perhaps be fairly assumed that the broth fairly corresponds with a weak gelatinous solution as regards its capability of supporting bacterial life; still it would be interesting to repeat M. Miquel's experiments with a solution of gelatine in place of the broth.—*Photo. News.*

MICROPHONIC CONTACTS.

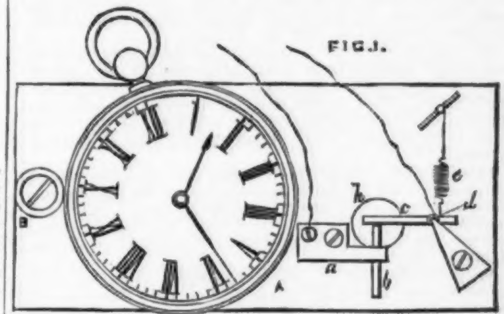
EXPERIMENTS BY MR. STROH.

MR. STROH has given an account of the following experiments, which he had made in continuation of those heretofore described by him:

The microphone used was again of the hammer-and-anvil pattern, this form being most suitable for experiment.

On a little board, A, Fig. 1, was fixed by means of a brass

FIG. 1.



holder, *a*, a thin carbon rod, *b*. Against the end of the latter rested loosely another carbon rod, *c*, which was mounted on a little spindle, *d*. A small spiral spring, *e*, served to vary the pressure at the contact between the two carbons, *b* and *c*.

The object of this arrangement was that the points of contact might be brought under a microscope, and for that reason the carbons, where they came into contact with each other, were made as flat as possible, and also thin at the edges, so that they might be fairly brought into the focus of the microscope.

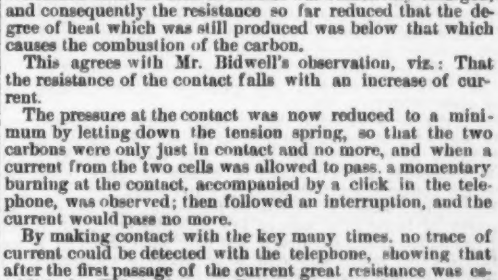
The little board, A, on which was placed a loud ticking watch as a source of sound, was fixed, at B, on a stand apart from that of the microscope, so that touching and adjusting the latter might not interfere with the microphone. A hole in the board at *h*, under the contact, was necessary to admit light from below.

In the circuit with the microphone were a telephone, a make-and-break key, and a small battery of one to three cells.

The two edges of the carbon contact appeared, although they were made with care, rough and jagged through the microscope, as represented in Fig. 2, and before the current passed, one or two of the projecting points were seen in contact only.

The tension of the spring for the first observation was such as was known by experience to be necessary to insure microphonic contact. By depressing the key, a current from two cells was now sent through the circuit, and the effect was closely observed by means of the microscope. What was noticed was a light, or, in fact, a burning away of the carbon; the two carbons came closer together during that burning, and presently another contact was made, and another light became visible. The carbons still approached until three or four points were in contact, each of which was illuminated, and at last, as it appeared, when there were a sufficient number of points of contact for the greater portion of the current to pass, then the burning ceased, and the ticking of the watch could be heard in the telephone.

FIG. 2. FIG. 3.



All this took place in the course of a few seconds; and while the microphonic condition remained, no light could be seen at the points of contact. But as soon as the battery power was increased the burning commenced again, and continued until the area of contact was sufficiently enlarged, and consequently the resistance so far reduced that the degree of heat which was still produced was below that which causes the combustion of the carbon.

This agrees with Mr. Bidwell's observation, viz.: That the resistance of the contact falls with an increase of current.

The pressure at the contact was now reduced to a minimum by letting down the tension spring, so that the two carbons were only just in contact and no more, and when a current from the two cells was allowed to pass, a momentary burning at the contact, accompanied by a click in the telephone, was observed; then followed an interruption, and the current would pass no more.

By making contact with the key many times, no trace of current could be detected with the telephone, showing that after the first passage of the current great resistance was established. This is also an effect observed and investigated by Mr. Bidwell.

The tension spring was now slightly tightened; this evidently caused the insulating film or substance which prevented the current from passing to be forced aside or broken through, for another current passed on making contact, but

only for a moment, and then again an interruption occurred. This could be repeated several times, until the spring was wound so tight that the insulating substance was broken through as soon as it was formed, and then the well-known boiling or hissing noise which we hear when the microphone is out of adjustment could be heard in the telephone. Sometimes the noise was a perfectly clear, musical note, and by adjustment of the spring it occasionally became as shrill as a whistle.

It was found possible to adjust the microphone so that while still listening to the noise the watch could be heard as well, and whenever this was successfully accomplished the tick of the watch was heard louder than under any other circumstances.

That experiment was made with a telephone of considerable resistance, which was now replaced by one of a very small resistance, only a few ohms, and an entirely different effect was obtained.

The spring was again let down, so that the carbons were only just in contact. A momentary burning was seen as before on passing the current, but the movable carbon was also driven away from the fixed carbon, and apparently remained repelled at some distance. Each time the circuit was completed by the key the movable carbon was repelled, and a continuous stream of sparks could be seen flying across the space.

The sound produced in the telephone by this effect resembled the crackling of burning wood. By tightening the spring the noise was frequently changed into a musical note, the pitch of which rose with the pressure.

By closer observation exceedingly fine dark lines could be seen which reached from every projection in the jagged edge of the loose carbon, right across the space to the fixed carbon. This showed that the movable or loose carbon was in a state of vibration, the amplitude of which was equal to the distance of the apparent separation of the two carbons.

This distance, which was considerable when the rate of vibration was low, became rapidly less as the rate was increased by tightening the tension spring, and a point was soon reached when the separation could no longer be seen, but was likely still to exist during the production of the higher sounds.

Another effect which was occasionally observed with the microscope during the production of the various noises above mentioned was that little fragments of carbon which probably became detached by their expansion by by heat, but still remained between the electrodes, were in a state of agitation.

There can be no doubt that during the production of these singing, hissing, or boiling noises, the current cannot be a constant one, but that in the case of the former it must be intermitted and of equal periods, while in case of the latter it is probably undulatory and of unequal or irregular periods.

It also appears evident that a current crossing a microphonic contact has a strong tendency to cause vibratory disturbances, and it seems, therefore, reasonable to suppose that during microphonic action, even when all is in good adjustment, the sound waves which are transmitted are accompanied by other vibrations which are due to the passage of the current itself.

The following reasoning has led to this supposition. Whenever it was possible to adjust the microphone so that the ticking of the watch could be heard during the production of singing or hissing noises, the *timbre* or quality of the sound of the ticking was exactly that of the hissing noise, and any change in the character of the latter was always accompanied by a corresponding change of the former.

It being a fact that sudden slight changes in the quality of sound are sometimes observed even when the adjustment of the microphone is perfect, that is to say, when no singing or hissing noises are heard, it must be that, whenever sound waves are transmitted, these have superimposed upon them other vibrations, possibly of a very high rate or pitch, which vary, and so produce change of *timbre* or quality. The latter would be the vibrations or disturbances produced by the passage of the current across the contact.

In the next experiment metallic contacts were substituted for the carbon ones. With platinum very good microphonic effects have been obtained whenever sticking could be avoided.

With a view to prevent sticking, a little oil was placed on the platinum contacts, but quite a different and unexpected phenomenon was observed. The oil, by its capillary attraction, of course remains surrounding the contact, and when the adjustment was made so that the ticking of the watch could be heard, little particles of dust or carbon which happened to be in the oil were seen in violent agitation, and to be spinning round with great rapidity.

It was puzzling for a time as to what caused the particles to be agitated in so violent a manner, but it appeared afterward that it was probably the effect of heat. The oil seemed to be boiling at the point of contact, even with a single cell, and when an exceedingly fine thread of smoke was observed arising from the contact, it became evident that such must be the case.

A number of carbon particles were then placed upon the oil, and when the current was again sent through and allowed to continue for a minute or so, the whole of the carbon dust, which was at first violently rotated and started in all directions, accumulated by degrees round the point of contact, and at last built up a pillar which forced the electrodes wide apart, and took the shape shown in Fig. 3.

Steel contacts were now substituted for platinum, and with them the same experiments turned out equally successful, but another curious phenomenon was observed—the black particles in the oil continued their movements for a considerable time after the current had been interrupted by the key. In some cases it took quite two minutes before they came entirely to rest.

Having also ascertained that a pillar could be formed with and without the carbon dust in the oil, the latter was now taken away altogether, and it was found that by a little humoring a pillar could be caused to grow even when the contacts were perfectly dry and clean.

This pillar, while in course of formation, had the appearance of being in a state of low incandescence, but it was concluded afterward that it was only surrounded by a dull, red glow, which appeared to be really a succession of sparks running along the surface of the pillar.

In concluding his remarks, Mr. Stroh said that he does not think at present that the formation of the pillar is directly connected with microphonic action, but regards it more as a secondary effect. He deems it advisable, however, that all observed effects should be recorded, and that by collecting and compiling them we may help in time to unravel the mystery that still surrounds microphonic contacts.—*The Electrician.*

SOLENOID GALVANOMETER OR AMPERE-METER.

At a recent meeting of the Society of Telegraph Engineers and Electricians, Principal Jamieson, of the College of Science and Arts, Glasgow, described a new form of current meter, which has lately been invented and patented by Prof. Blyth, of Anderson's College, Glasgow. The instrument as shown at the meeting, will at once be understood by comparing diagram 1 with the following index of parts:

T+ and T—, positive and negative terminals, to which wires from the battery or dynamo are attached. The current passes from T+ to T— through

SC, solenoid coil, composed of No. 8 B. W. G. insulated copper wire (0·07 ohm resistance)

IC, iron core made of best soft iron, in the form of a thin tube; when current passes, IC is sucked down inside SC, against the resistance offered by

SS, spiral spring, which is attached to IC by loop, L^1, and at top to L^2

AN, adjusting screw at L^2, for adjusting the zero.

R and P, rack and pinion, fixed to

BT, brass tube, which slides freely inside an outer brass tube. The inner brass tube carries a vernier, which by by its position indicates on

S, a finely divided scale (fixed to the outer brass tube), the current strength or number of amperes flowing through the solenoid coil, SC.

M, mirror, by looking down upon which the zero mark, 0, on IC, as well as the position of the vernier on the divided scale, are seen simultaneously and parallax avoided.

L, a spirit level.

L, three leveling screws.

To take a test with this instrument.

1st. Level it by means of the three screws, LS.

2d. Free IC, and observe if the zero mark on the iron core and the zero of vernier and scale, S, agree; if not, adjust by screw, AN, and by R and P.

3d. Attach to terminals, T+ and T— the wires from battery dynamo, or other source of electricity. Immediately the current passes through the solenoid coil, SC, the iron core, IC, is sucked down proportionally to the strength of current passing.

4th. Raise the iron core, IC, by means of the rack and pinion, RP, until the zero mark on the iron core again appears at its zero position.

5th. Read the position of the vernier on scale, S, which may be divided into amperes or millimeters. If into millimeters, then look in attached table for the corresponding amperes.

One of the great advantages which will recommend itself to every practical electrician, and which was very clearly pointed out by Prof. Jamieson, is that it is unaffected by either the earth's magnetism or proximity of iron or magnets. It has the further advantage of not depending in any way upon so-called permanent magnets, which we know to our cost are not permanent.

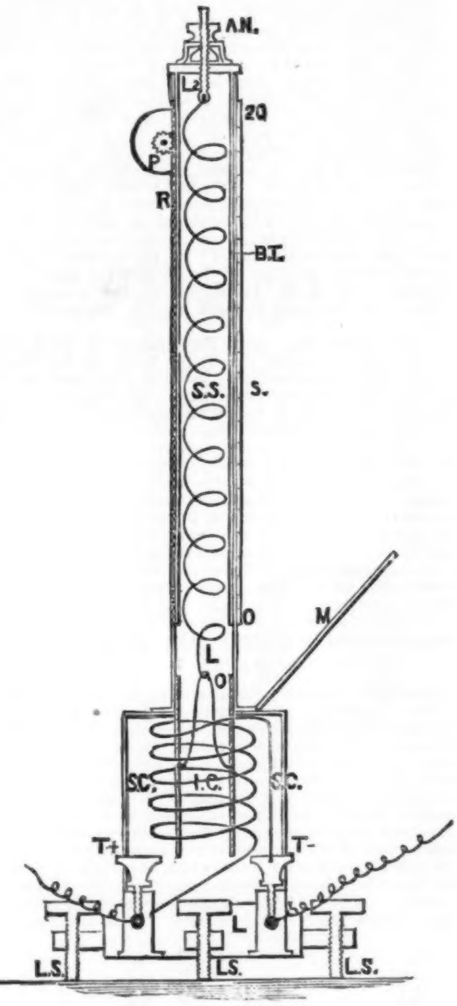
Its range and sensibility are very great, the instrument shown indicating from 0·1 ampere to 24 amperes to the second decimal place, and by the addition of two additional solenoid coils it can be made serviceable up to 100 amperes.

Prof. Blyth has also made provision for making potential or electromotive force galvanometers on the same principle.

The instrument has been graduated by the electrolysis of water, which is believed to be the most correct method (see diagram 2).

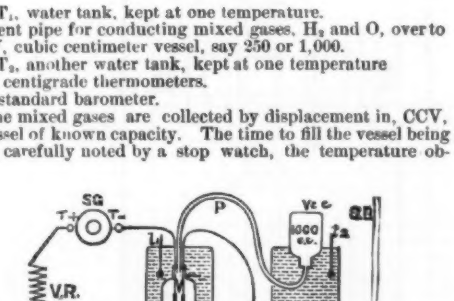
PLAN OF CONNECTIONS USED IN GRADUATING

B, battery or current generator.
K, key for closing circuit.
VR, variable resistance coil for adjusting current strength.
T+ and T—, positive and negative terminals of
SG, solenoid galvanometer.
V, Voltameter placed in



W_1 T_1, water tank, kept at one temperature.
P, bent pipe for conducting mixed gases, H_2 and O, over to CCV, cubic centimeter vessel, say 250 or 1,000.
W_2 T_2, another water tank, kept at one temperature
t_1 t_2, centigrade thermometers.
SB, standard barometer.

The mixed gases are collected by displacement in, CCV, a vessel of known capacity. The time to fill the vessel being very carefully noted by a stop watch, the temperature observed, as well as the barometer in millimeters, we have at once, by a combination of Gay Lussac's and Boyle's laws—



$$C = \frac{V \times 273 \times P}{0{\cdot}1764 \times t\ (273 + \theta) \times 760}$$

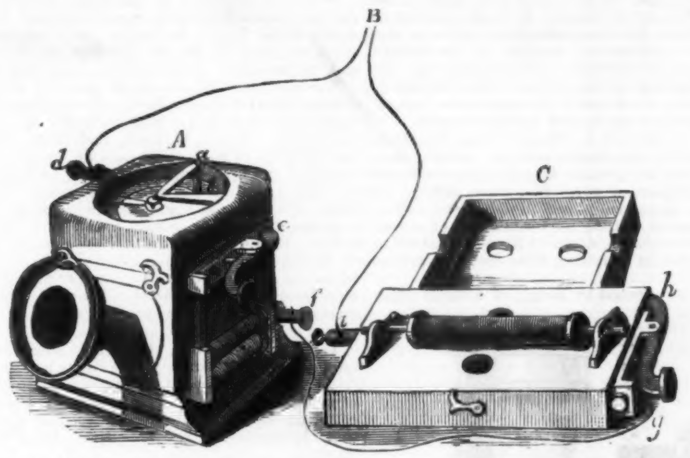
C	=	current in amperes.
V	=	volume of gas given off in CC.
P	=	height of barometer.
t	=	time in seconds.
θ	=	temperature cent.
0·1764	=	volume of mixed gas, H_2 and O, given off per second by 1 ampere.
273	=	constant for variation of volume of a gas with temperature.
760	=	standard barometric pressure.

—*Electrical Review.*

According to Mr. Traill, the engineer of the Giant's Causeway and Portrush Electric Tramway, the total prime cost will be about £21,000 for six and one-half miles of tramway, the cost of buildings, rolling stock, electric plant, engines, law, Parliamentary and engineering expenses. He says also that the electric car is able to ascend a long, continuous hill of about one and one-half miles in length, and with a gradient of 1 in 35, drawing a second car behind it, and work as readily and as well at a distance of two miles from the generator as adjacent to it.

REIS' TELEPHONE.

IT may, perhaps, interest the readers of *The Electrician* to read the *prospectus* which Reis issued with his telephones in August, 1863, of which I inclose for your inspection an original print, together with the accompanying translation. I may add that a copy of the prospectus (reprinted in Pisko's "Recent Apparatus of Acoustics") has been in the British Museum for the last dozen years, and another copy in my own possession for seven years. Written one month later than the letter to Mr. Ladd, which has so lately been reprinted in your columns, it explains several of the obscurities in that letter. It is valuable also as showing, among other things, the function of the auxiliary apparatus which Reis used as a call-signal, and which in his letter to Mr. Ladd he had styled the "complementary telegraph."



FACSIMILE OF ILLUSTRATION OF REIS' APPARATUS, TAKEN FROM HIS PROSPECTUS.

The question raised by the letter of Mr. Farquhar in your columns as to whether the existence of this telegraphic signaling apparatus did not show that the instrument was intended only to transmit music is most satisfactorily answered by the prospectus and by the figures. In the first place, had the "complementary telegraph" been intended to make up for supposed deficiency of the telephone it would have been placed at the side of the receiving, not of the transmitting, part of the apparatus. It position at the side of the transmitter shows that it was put there to enable the person who was listening at the receiving end to telegraph back to the person who was singing or talking at the transmitter.

Further, the instructions given for signaling are a sufficient reply in themselves to the question raised by Mr. Farquhar. If the person who is listening to the receiver wants the person at the transmitting end to *talk*, he signals *two* strokes; if he is to *sing*, *one* stroke is signaled.

Lastly, a most curious commentary on Reis' utter unfamiliarity with the technicalities of telegraphy is afforded by the code which he suggests for the use of the person who wants to signal through the "complementary telegraph." Yet the Morse code was known in Germany long before 1863.

Yours, etc.,
SILVANUS P. THOMPSON.

April 21, 1883.

REIS' PROSPECTUS.
(Translation.)
Telephon.

Each apparatus consists, as is seen from the above illustration, of two parts: the telephone proper, A, and the reproduction-apparatus [receiver], C. These two parts are placed at such a distance from each other that singing or the tones of a musical instrument can be heard from one station to the other in no way except through the apparatus itself.

Both parts are connected with each other, and with the battery, B, like ordinary telegraphs. The battery must be capable of effecting the attraction of the armature of the electromagnet, placed at the side at station A (3 to 4 6 in. Bunsen elements suffice for several hundred feet distance).

The galvanic current goes then from B to the screw, *d*, thence through the copper strip to the little platinum plate at the middle of the membrane, then through the foot, *c*,* of the angular piece to the screw, *b*, *in whose little concavity a drop of quicksilver is put*. From here the current then goes through the little telegraph apparatus, *e f*, then to the key of Station C, and through the spiral past *i* back to B.

If now sufficiently strong tones are produced before the sound-aperture, S, the membrane and the angle-shaped little hammer lying upon it are set in motion by the vibrations; the circuit will be once opened and again closed for each full vibration, and thereby there will be produced in the iron wire of the spiral at Station C the same number of vibrations which there are perceived as a tone or combinations of tones (chord). By imposing the little upper-case [oberkästchen] firmly upon the axis of the spiral, the tones at C are greatly strengthened.

Besides the human voice (according to my experience) there can also be reproduced the tones of good organ pipes from F to $\overline{\overline{\overline{c}}}$, and those of a piano. For the latter purpose A is placed upon the sounding board of the piano (of thirteen triads, a skilled experimenter could with all exactness recognize ten).

As regards the telegraph apparatus placed at the side, it is clearly unnecessary for the reproduction of tones, but it forms a very agreeable addition for convenient experimenting. By means of the same it is possible to make one's self understood right well, and certainly by the other party. This takes place somewhat in the following manner. After the apparatus has been completely arranged, one convinces one's self of the completeness of the connection and the strength of the battery by opening and closing the circuit, whereby at A the stroke of the armature, and at C a very distinct ticking is heard.

By rapid alternate opening and closing at A, it is asked at C whether one is ready for experimenting, whereupon C answers in the same manner.

Simple signals can, by agreement, be given from both stations by opening and closing the circuit one, two, three, or four times. For example,

1 beat = sing,
2 beats = speak, etc.

I telegraph words thus that I number the letters of the alphabet, and then transmit their numbers:

1 beat = A,
2 beats = B,
3 " = C,
4 " = D,
5 " = E, etc.

Z would accordingly be designated by 25 beats.

This number of beats would, however, appear wasteful of time, and would be uncertain, wherefore I employ for every five beats a dactyl-beat (dactylusschlag), and there results:

— ∪∪ for E,
— ∪∪ and 1 beat for F, etc.

Z = — ∪∪ — ∪∪, — ∪∪ — ∪∪ — ∪∪, which is more quickly and easily executed, and easier to understand.

It is still better if the letters are represented by numbers which are in inverse proportion to the frequency of their occurrence.

Friedrichsdorf, near Homburg-by-the-Height, Aug., 1863.

PHIL. REIS,
Teacher at L. F. Garnier's Institute for Boys.
—*The Electrician.*

* *c* is not shown in the original of this illustration, and does not, therefore, appear in our engraving, but readers will readily see where it should be.—ED. *E.*

MARCEL DEPREZ.

MARCEL DEPREZ, who is so well known for his numerous and remarkable electrical discoveries and inventions, was born on the 29th of December, 1843, near Chatillon-sur-Loing, France. After passing two years of his youth at the Lyceum Louis le Grand, he left that institution and finished his studies by himself, through attending public lectures and working in the popular libraries of the Sorbonne and Arts-et-Metiers. In this way he succeeded in becoming Bachelor of Sciences. In 1864 he presented himself at and was received into the Ecole des Mines; but, after one year of study, he left this school in order to become the secretary of Mr. Combe, its director. He held this position for 14 years. At this epoch he began to study steam engines and locomotives, and finally devised a locomotive provided with an arrangement for distributing steam that effected a saving of 3 per cent of coal. This locomotive was run on the line of the North for over a year. During his entire life Mr. Deprez has busied himself with great powers and high speeds—locomotives, cannons, and finally the transmission of power by electricity.

After his labors on locomotives he devoted much time to the study of the pressure of gases, and of the powder in the cannons used in the navy. The minister of the navy in recognition of the value of these studies awarded him, in 1881, the Cross of the Legion of Honor.

Mr. Deprez's studies in electricity began in 1878. His first prominent invention was the industrial galvanometer, a quick operating, exact and strong instrument for accurately measuring the electric currents employed in the industries. He also invented the first counter of electricity, the object of which is to measure the quantity of electricity used by the consumer. He likewise constructed the most important part of the experimental car of the Railway Company of the East which attracted so much attention at the Universal Exhibition of 1878, and at the Exhibition of Electricity in 1881. This car, which constituted a genuine laboratory of experimental physics, gained for him a gold medal in 1878. At the Exhibition of Electricity he likewise gained a diploma of honor for the only system of distributing electricity that worked so as to satisfy all the conditions imposed.

At the exhibition at Munich, in 1881, Mr. Deprez obtained the greatest result of his entire scientific career. Up to this epoch he had always maintained the possibility of doing a thing that his adversaries had denied, and that was of transmitting force through an ordinary telegraph line of great length, say 57 kilometers going and 57 returning, 114 kilometers in all. At this exhibition the experiment was tried, the line selected being the one running from Munich to Miesbach, a distance of 57 kilometers. The force transmitted by this wire from Miesbach, and which reached the Crystal Palace at Munich, produced in this building a ½ H.P. Although astounded at this experiment, his adversaries began to fight him harder than ever, and even went so far as to taunt him because he, a Frenchman, had tried the experiment in Germany, and had gained his success on a foreign soil. He then proposed to repeat the experiment in France, and the Company of the North therefore kindly put their workshops at his disposal. These experiments were tried with more powerful machines than those of Munich, and before a committee named by the Academie des Sciences. This committee, which consisted of Messrs. Bertrand, Tresca, Cornu, De Lesseps, and De Freycinet, after a month and a half of experimentation, presented through Mr. Cornu a report which declared that the result obtained by Mr. Deprez exceeded anything that had been obtained by any one before him, and that such result would mark an epoch in the history of electricity. The report ended by requesting that the Academie should send a vote of congratulations to Mr. Deprez; this was accordingly done, the vote being unanimous.

As well known to those who have kept track of the progress of electricity, Mr. Deprez's idea is to utilize the immense natural forces (streams and waterfalls) that are now lost, and which much exceed the power of all the steam engines combined that are at present running in the whole of France—representing as they do several millions of horse power. At the present time, to obtain such power it is necessary to carry coal at a great expense; and, as this combustible is being gradually exhausted in France, it is only a question of time when fuel will have to be imported at still further expense to supply steam engines. With electricity, on the contrary, all these natural forces, which are inexhaustible, will be utitized and distributed by a simple wire to the houses or factories of all who may have need of them, and will be capable of producing in these either power, light, or heat.

MARCEL DEPREZ.

We are indebted to *La Monde Illustre* for these particulars and the illustration, which latter was published originally in *La Lumiere Electrique.*

La Lumiere Electrique describes the lighting of the Alliser Theater, in Havana, in which Edison lamps are used. One hundred and ninety-three lamps are used, of which one hundred and eighty-two are of one carcel, and eleven of two carcels, replacing three hundred and forty-two gas burners. The difference of temperature within the theater under the new and old conditions is 14 deg. F.

BOURDON'S CONTINUOUS CIRCULATOR.

IN most cabinets of physics there are to be seen certain glass apparatus that are called "circulating fountains." These apparatus, while they demonstrate the ingenious application of a little known law of hydrodynamics, are also at the same time objects that please one's eyesight, in that they produce a genuine illusion when we watch the contours of the glass tube in which are circulating drops of colored alcohol, separated by bubbles of air; for, although the tortuous glass tube is entirely immovable, it seems, on the contrary, to be possessed of a rotary motion.

In this sort of fountain, a specimen of which is shown in Fig. 1, the circulatory motion of the drops of colored alcohol is obtained by utilizing the motive power of a column of liquid back of the apparatus for raising and keeping in motion another column; this latter being notably lighter because it consists of drops of alcohol separated by bubbles of air, while the former consists of liquid only. The means employed for obtaining such a regular alternation of a drop of alcohol, followed bp a bubble of air, is very simple. The straight, vertical tube, which we shall style the motive column, is bent at its base into the shape of a U, enters the lower reservoir, with which it is united, and terminates in an ajutage of small diameter which allows a jet of liquid to spurt out very near the origin of the tortuous tube. About half of the colored liquid furnished by the ajutage rises drop by drop into this tube, while the other half runs slowly down along the sides of the lower reservoir and forces a volume of air equal to its own to interpose itself between the drops of alcohol in measure as these rise in the tortuous tube.

But, gradually, the upper reservoir becomes empty, while the lower gets full; and, after an operation of fifteen or twenty minutes, all motion ceases; so, in order to start the apparatus again, it becomes necessary to invert it and keep it in that position for a certain length of time, in order that the liquid, passing again in the form of a continuous vein through the inverted tube, may fill the reservoir which supplies the motive column.

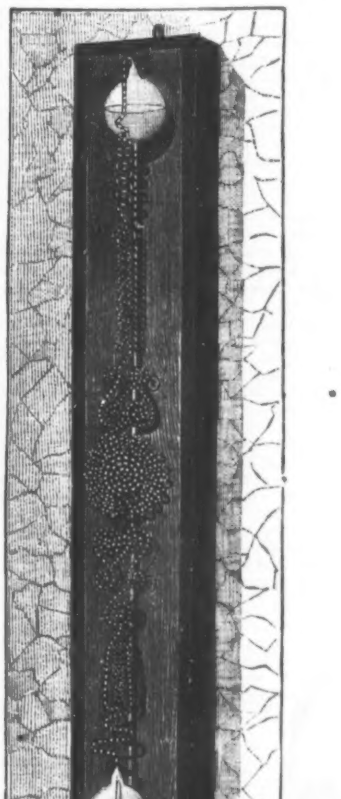


FIG. 1.—CIRCULATING FOUNTAIN.

If, after this, the fountain be placed back in its first position again, it will begin to operate, but only for a length of time that scarcely exceeds twenty minutes.

The continuous circulator shown in Fig. 2 does not require any such maneuver as that just described, but operates uninterruptedly.

This apparatus, which is the invention of Mr. E. Bourdon, is arranged as follows:

A reservoir, capable of holding three or four liters of water, is kept at a constant level by means of a float cock attached to a water pipe. Beneath this reservoir there is adjusted a small suction tromp provided at the side with an exhaust pipe terminating in the bulb situated above the circulator.

A straight glass tube, 1·5 meters in length by 4 millimeters in diameter, is connected with the tromp by a small rubber sleeve, and dips at its lower extremity into a discharge vessel which is provided with a waste pipe that carries off the water discharged by the vertical tube.

This arrangement constitutes the motive apparatus, properly so called.

The circulator consists of five parts, all of glass, as follows: The inverted bulb, with neck, placed at the top of the apparatus; the tortuous tube, forming designs that may be varied in hundreds of ways; the return tube, placed to the left of the latter; the receptacle containing the colored liquid, and the distributing tromp with its regulating cock and its U shaped tube, connected by a sleeve with the tortuous tube (Fig. 3).

These five pieces are affixed to a wooden support, according to the arrangement shown in Fig. 2; but, although the tromp is here represented as being close to the circulator, it may, in fact, be placed at some meters distance, in a neighboring apartment, so that the apparatus by means of which motion is kept up may be hidden from sight. The air exhaust tube which connects the tromp with the bulb has, in such a case, a greater length; but this in no wise interferes with the operation of the apparatus.

The circulator is set in operation as follows:

The small receptacle placed under the return tube is half filled with water which has been slightly colored with archil or aniline blue, care being taken to keep the regulating cock closed that connects this receptacle with the tromp. This done, water is allowed to enter the reservoir by opening the float cock, and its entrance into the suction tromp is moderated in such a way that the air carried along by it forms with it a sort of miniature cataract composed of regularly spaced drops of water and bubbles of air. The partial vacuum that this feeble fall of water keeps up in the bulb surmounting the apparatus has the effect of setting in motion the colored liquid supplied by the small receptacle at the base of the return tube, and of causing it to circulate from top to bottom. In order that the ascending motion of the colored liquid shall be continuously kept up in the designs formed by the tube of the circulator, it is necessary that the return column shall be heavier than that of the circulator, and that this necessary condition of the apparatus' operation shall be kept up in a constant and regular manner.

At first sight, this would seem a difficult thing to effect; for the column formed by the return tube is shorter than that formed by the circulator, whose length makes the travel greater, and, as a consequence, gives rise to an increase of resistant work. The means employed to obtain this difference in gravity consists in causing the circulation of a certain quantity of air between the drops of liquid contained in the circulator tube, and in admitting none into the return tube.

The first condition is effected by means of a small regulating cock, which is kept open in such a way that the liquid shall enter drop by drop only, and that there shall be left between the drops regularly spaced intervals of air. A hole formed in the stopper at the side of the small cock allows entrance into the tromp of the air that separates the drops of water on their entrance into the tortuous tube.

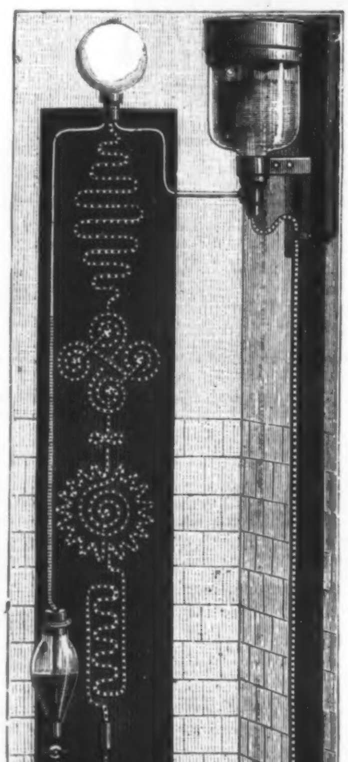


FIG. 2.—BOURDON'S CONTINUOUS CIRCULATOR.

The second condition is effected by giving the return tube an internal diameter sufficiently large (about 8 millimeters) to allow the liquid descending from the bulb to run along the sides of the tube without ever imprisoning the air with it.

It is necessary, then, to bestow a little attention on the regulation of the small cock that supplies the colored liquid to the tromp of the circulator or distributing tromp; for, if it discharges too much, the column will not carry along sufficient air, and the motion will be checked; while if, on the contrary, it does not discharge enough, the opposite will be the case, the speed will be increased, and the drops of liquid will be spaced too far apart. But, when the apparatus is well regulated, the colored liquid, under the influence of atmospheric pressure, rises and forms a string of brilliant pearls extending up to the bulb that surmounts the apparatus, and then runs down through the return tube into the receptacle, giving up, as it does so, all the air that had been carried along; and the motion continues as long as the reservoir of the suction-tromp is supplied with water.

In sum, it will be seen that four principal points characterize this continuous circulator, and make a new apparatus of it notably different from the old circulating fountain.

These points are:

(1.) The mode of effecting the regular spacing of the drops of water in the tortuous tube.

(2.) The mode of applying the partial vacuum that serves to keep in motion the liquid mixed with air which lends brilliancy to the designs of the circulator.

(3.) The application of the principle of hydrodynamics by the aid of which there may be made to circulate for entire days the same quantity of liquid in a direction opposite that which the laws of gravity would compel it to take, and that too without the possibility of the liquid that forms the motive power mingling with that whose role is to keep up the motion.

(4.) The prosperity that it possesses of being easily transformable into an apparatus of evident utility, and as a sure means of ascertaining the degree of purity of the air or gases, that it may be desired to submit to analysis.

This apparatus not only solves a problem in hydrodynamics which is interesting to study, and is not only an interesting object to please the eye, but it has a useful application in all that touches those microscopic observations that are so much employed at present for ascertaining the quantity and nature of the microbes that exist in the air that we inhale, and that have a greater influence than is generally supposed upon the hygienic conditions necessary to preserve the health of animate beings.

When the circulator is employed for this kind of observations, instead of a tube shaped in fancy designs like that shown in the figure, we simply adopt one or several straight tubes, adjusted on the one hand to the distributing tromp, and, on the other, to the bulb surmounting the apparatus.

We have seen that the small quantity of liquid which circulates uninterruptedly from the distributing tromp to the upper bulb never mixes with the water that supplies the suction tromp. It will be easily understood, then, how, under the influence of the partial vacuum caused by the suction tromp in the upper bulb, the water, on rising in the circulator tube, carries along with it as many bubbles of air as drops of water, and holds back in its passage all the microbes contained in the air whose purity is to be examined. It suffices, then, in order to know the number and the species of microbes contained in a given volume of air, to measure, by means of a gas-meter, the number of cubic meters that have been passed into the circulator, in contact with a small quantity of distilled water contained in the receptacle placed at the base of the apparatus.

To count the number of infinitely small animalcules contained in a small quantity of water is not an easy thing to do; yet, in the hands of observers used to this delicate sort of work, a highly magnifying microscope permits not only of counting these small living beings, but also of classifying them by species, which are often very different from one another.

Amateur physicists who are content to look at the apparatus from the standpoint of amusing experiment might arrange it in a still more original way than that shown in our cut. Instead of placing the circulator against a board, it might be fixed to a polished or silver-plated copper tube in which the suction-tube, as well as the water-return tube, etc., would be hidden. The apparatus, thus simplified and rendered more mysterious, might be placed in the angle formed by two mirrors, so as to show the object and its images, and thus constitute a sort of kaleidoscope.

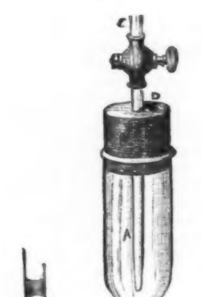


FIG. 3.—DISTRIBUTING TROMP.

Circulating fountains were formerly much in demand among physicists. Their effects may be varied in several ways. At the College of France there is one that contains a fluorescent liquid, which has a charming effect in darkness, after an insolation.

Finally, we think proper to mention, in conclusion, the largest circulating fountain that was ever constructed. This figured at the London Exhibition of 1862. It formed a true architectural structure, each of whose four sides was at least 2 meters in length and height, with colonnades, windows, porches, domes, etc., the whole made of glass tubes in which water circulated. The effect was of the most singular nature.—*La Nature.*

ANGULAR MOTION IN WIND STORMS.

By JAMES HOGG.

BEING at sea recently in one of the violent storms of wind and snow which of late have visited our coast, we became greatly interested in observing the varied action of the wind upon the water, and the difference of effect which it produced in the size and motion of the waves as we proceeded on our course. The wind being very strong and nearly dead ahead, we progressed but slowly, and this gave us the more opportunity to observe its effects. It blew steadily and continuously, or very nearly so, from the same point of the compass; and apparently with the same velocity and force. The engines of the ship were slowed down, and worked with the regularity of a watch, so that there was no apparent increase of velocity or force of the wind due to increased speed of the ship. We propose to note some of the observations we made and the deductions we made therefrom, although in so doing we intend that they shall be merely suggestive, and given to draw the attention of others who have made meteorology a special study.

We noticed that at the height of the topmasts the snow did not come down perpendicularly through the air, but descended at an angle of about thirty degrees, and that when it came near the surface of the sea, it was thrown upward at a nearly corresponding angle, producing a kind of undulatory motion following the lines of the waves. That in the hollows of the waves very little snow fell into the water, and that what did fall was caught by the crests of the waves as it was driven forward horizontally by the wind. We also noticed that the angle of the waves on their windward side was

not far from a right angle to that at which the snow appeared to be descending from above, and that the waves assumed on their windward side the form of a cyma recta, and on the leeward side a form approaching the cavetto, if we may be allowed to use architectural terms to express these forms. Now these are very nearly the forms which a force pressing at an angle of forty-five degrees upon the horizontal surface of a mobile substance or fluid would cause such surface to assume.

The generally received idea of wind storms is, that they are masses or bodies of air moving, either horizontally forward, or revolving upon the axis of the body of air, and that this revolving body may also move forward in a direct line. That if these masses of air were visible to us, in either case we should see them lying in horizontal strata of different densities. Wind gauges for testing the pressure of the wind are therefore placed vertically, those for testing its velocity are placed horizontally.

From what we have stated of the snow falling at an angle it occurred to us that the air in descending from the higher regions of the atmosphere, whether it moves horizontally or in rotating columns, comes down at varying angles, and in the latter case visible to us, the various strata of which it is composed would somewhat resemble the lines made by winding a ribbon diagonally round a cylinder. If then it strikes the water, it must do so with much greater force and power of throwing it into waves than if it passed over it horizontally, or came down upon it vertically, and this power would be in proportion to the angle of descent and the velocity with which it rotated. A revolving or gyrating storm will also travel in a circle, or some form approaching thereto; this also will add to its power of disturbing the surface of the water, and will produce a more broken sea.

The wind often blows horizontally without rotating in columns, as can frequently be seen during an ocean voyage, especially in the summer season, when a brisk wind will often occur which will scarcely produce any sea at all. This occurs in the monsoons and trade winds, which, blowing for weeks and months together from the same point of the compass, and at a regular rate of velocity, have but little effect upon the surface of the sea.

The soil also blows down vertically with or without a gyratory motion, and instances are not wanting of perpendicular columns of air descending and spreading out on the surface of the water, the gyratory motion being continued in the horizontal portion. In an article written by Capt. Horsburgh in Nicholson's *Journal of Natural Philosophy*, he says: "I have several times, in calm weather, seen a cloud generate and diffuse a breeze on the surface of the sea, which spread in different directions from the place of descent. A remarkable instance of this occurred in Malacca Strait, during a calm day, when a fleet was in company; a breeze commenced suddenly from a dense cloud; its center of action seemed to be in the middle of the fleet, which was much scattered. The breeze spread in every direction from a center, and produced a singular appearance in the fleet, for every ship hauled close to the wind as the breeze reached her, and, when it became general, exhibited to view the different ships sailing completely round in a circle, although all were close hauled to the wind." It is not uncommon to hear sailors speak of a wind that blows the sea down; a horizontal wind will do this, but it is often produced by vertical winds, especially when accompanied with rain. We have seen this effect produced in a thunder storm at sea; when sailing over a somewhat rough sea, with a favorable stiff breeze, such a storm was encountered, crossing our course at right angles to the breeze by which we were sailing. The wind and rain came down perpendicularly, or nearly so, from the clouds overhead, and in a short time there was not a wave to be seen, and the ship lay as motionless as she would do in a dead calm. In a couple of hours the storm had passed away, and we were again accompanied by the previous wind, and soon afterward by the rough sea, as before the storm.

In another instance, when sailing with a fair wind and smooth sea, we noticed at five or six miles distance a great disturbance on the surface of the water, it rising into great waves; sail was immediately taken in, but before this could be fully accomplished this breeze crossed our path, and came near taking the masts out of the ship; and as it passed away from us it left a line or path of high waves on the smooth sea, presenting a singular appearance. In this case no clouds were visible, and from the action of this column of wind on the ship and sea, it was apparent to us that, besides its rotary motion, it also had the screw motion we have already spoken of. In whirlwinds and waterspouts we often see this motion, but it is an ascending instead of a descending line.

Something more would therefore be necessary in calculating the force of an approaching storm than merely ascertaining its horizontal force by the wind gauge, and the velocity with which it travels over a certain extent of land or sea. It would appear to be also necessary to ascertain the angle at which the particles of air were making in their course to the base of the column, in order to know what would be its ultimate effect upon such obstructions as it might meet with on land, or in producing waves upon the ocean. It would not appear to be very difficult to devise and construct an instrument to do this. If it were done, it might be the means of adding somewhat to our knowledge of the formation and action of storms, and also be of use in giving vessels an indication whether the approaching offland storms were likely or not to produce dangerously high seas.

PERCEPTION OF COLORS IN DARKNESS.

M. CHARPENTIER has communicated to the *Comptes Rendus* an account of experiments carried out by him with the object of investigating the preception of white and of various colors by the human eye. He thinks that the idea of color may be physiologically considered as a perception of difference of brilliancy between the colored object and a white ground. He has therefore constructed scales showing the degree of brilliancy to which a color must be raised in order to enable it to be distinguished from the ground. Practically the ground was in complete darkness, and the observations therefore resolved themselves into the question of deciding the amount of intrinsic brilliancy that would enable colored objects to be distinguished in the darkness against an obscure background. Neglecting the measurements given by M. Charpentier it may be gathered that he finds yellow and red —or, as he calls them, the warm colors—more visible than white under these circumstances; while the cold colors, green and blue, are less visible than white. This fact is constant in all M. Charpentier's experiments; and shows once more that the visibility of a given source of light in enveloping obscurity greatly depends upon the proportion of yellow and red rays contained in it.

DETERMINATION OF LEAD FROM ITS ORE BY ELECTROLYSIS.*

By AD. SOMMER, Ph.G., of the University of California.

WHILE engaged in experimenting on the determination of lead by means of zinc amalgam, a full account of which will appear shortly, it became very desirable to me to have a simple and correct method of determining lead quantitively, for the purpose of checking my results. Of the methods most commonly employed, the crucible assay is by far too unreliable, the unavoidable loss of metal reaching often six per cent., while the determination of lead as sulphate is rather tedious, and, like the former method, though to a less extent, liable to give low results. I, therefore, investigated the accounts given by various authors in regard to the electrolysis of lead-salts, and finding the uniform statement that by the action of the galvanic current, metallic lead is deposited on the negative, and peroxide of lead on the positive pole, it occurred to me that the reduction of the salt to metallic lead must be the first reaction, and the presence of peroxide only due to the oxidation of this metallic lead, and that, therefore, if it should be possible to prevent this oxidation by amalgamating the lead the moment it is liberated, the amount of lead contained in the sample might be found by deducting the amount of mercury employed in amalgamating.

A number of trials proved the correctness of my theory. Without recounting the successive experiments that led me to the adoption of the apparatus now in use, I shall confine myself to simply describe the latter:

In one end of a narrow glass tube is fastened, by means of a small piece of rubber tubing, a round stick of graphite, which may protrude about one-half inch beyond the tube. The upper end of the glass tube is bent in such a way that when hung on the edge of a large test tube, in which the electrolysis of the ore is to take place, the lowest point of the graphite will be from one or two inches from the bottom of the test tube. Into another glass tube of the same caliber is fastened, in a like manner, a piece of carbon, such as is used in electric lamps; but this carbon-pencil should not protrude more than one-quarter of an inch, and must touch the bottom of the test tube. After the tightness of the fitting has been ascertained, the tubes are nearly filled with

mercury and placed into the test tube. A weighed amount of pure mercury (from twenty to forty grammes) is then poured into the test tube, and sufficient chlorhydric acid added (acid containing from 15 to 20 per cent. HCl has generally been employed) to just cover the graphite pencil. A small quantity (about one gramme) of powdered lead ore (for instance, galena) is now accurately weighed out on a small piece of paper, wrapped up, and thrown into the test tube. The whole apparatus is placed over a water-bath or a small coal oil stove, in order to keep it at a temperature of about 70° C., and connected with a battery consisting of about four Meidinger or Daniell cells, or instead of these two Bunsen or Grove cells. The connections are made by plunging a copper wire attached to the negative (zinc) poles into the tube holding the carbon pencil, while the positive (copper) poles are connected by means of another wire with the other tube holding the graphite pencil. The moment the circuit is closed, the electrolysis within the test tube commences: hydrogen, and, in presence of lead, hydrogen sulphide and lead are eliminated on the surface of the mercury, which represents the negative pole of the battery, while oxygen, and through it chlorine, hypochlorous acid, and—while hydrogen sulphide is present—even sulphuric acid are generated the graphite pencil representing the positive pole of the battery.

About five hours are required to thus entirely decompose about one gramme of galena. When the smell of hypochlorous acid becomes very distinct, the connections may be broken, the mercury, now containing all of the lead, poured into a shallow glass or porcelain vessel, carefully washed with distilled water, in order to remove the silica and other insoluble constituents of the ore, dried, and weighed.

The increase in weight is the quantity of lead contained in the ore.

The employment of carbon in two of its allotropic forms as a conductor of the galvanic current was decided upon for the following reasons:

Metals, even platinum, cannot be employed, since they are either acted upon by the acid or amalgamated by the mercury; and when the graphite and carbon pencils are reversed, or either form is employed on both poles, it is found that the graphite is soon disintegrated by the nascent hydrogen, while the carbon pencil meets the same fate from the nascent oxygen. Why this is so, I must leave to some one else to explain.

*A paper read at the California Pharmaceutical Association meeting.

SEPARATION OF NICKEL FROM COBALT.

By G. VORTMANN.

THE author, after pointing out the defect of all the ordinary methods of separating these metals, suggests the following process, depending on the oxidation of cobalt salts in ammoniacal solution by sodium hypochlorite. When such a cobalt solution mixed with sal-ammoniac is treated with this reagent, complete oxidation takes place, even at ordinary temperature, the liquid assuming a red color. The reaction is accelerated by boiling, the solution in a few minutes assuming a deep reddish-yellow color, and then containing the cobalt chiefly in the form of a luteo-cobaltic salt. On diluting with water after cooling, and adding a small quantity of potash-solution, the liquid, if it contain nothing but cobalt, will remain clear even after standing for several hours, but nickel if also present will be deposited in a short time as hydroxide. In this manner, mere traces of nickel may be detected in a cobalt solution, and likewise a very small quantity of cobalt in presence of nickel. A blue ammoniacal solution of nickel containing a very small quantity of cobalt usually exhibits, after treatment in the cold with sodium hypochlorite, a distinct red violet color; but even if the quantity of cobalt present is too small to produce this effect, the liquid, after dilution with water, addition of potash lye, and filtration from precipitated nickel hydroxide, will exhibit a faint yellow color; and if the quantity of cobalt be too small to produce even this faint coloration, its presence may be detected by the black precipitate formed on addition of ammonium sulphide. If the quantity of cobalt present is sufficient to give the solution a strong red color, the cobalt-ammonium compound contained in it will be decomposed on boiling, with separation of brown cobaltic hydroxide. As nickel hydroxide is dissolved in small quantity by ammonia, even in presence of potash or soda, care must be taken in the first stage of the process not to add too large an excess of ammonia, as it would then become necessary, in precipitating with potash, to dilute the liquid to a considerable extent, which would interfere with the subsequent operations.

The author gives the details of a number of experiments made by this method, showing that in many cases it gives results more exact than those which are obtained by the use of potassium nitrite or potassium cyanide.—*Monatsh. Chem.*

ANTHRACENE FROM PETROLEUM RESIDUE.

THE conversion of the hydrocarbons of the marsh gas and ethylene series, observes M. Delahaye in the *Revue Industrielle*, into hydrocarbons of the aromatic series, was considered impracticable before the recent researches of Burg and Liebermann upon the distillation of peat tar, and those of Beilstein and Kurbatow upon Caucasian petroleum. These chemists have established that the hydrocarbons of these latter substances do not belong to the series of marsh gas and ethylene. Berthelot has shown that, in the distillation of coal, ethylene and its analogous constituents of tar are derived from acetylene. Letny has obtained benzol, phenol, naphthaline, anthracene, etc., by distilling petroleum residue. Liebermann and Burg have prepared these bodies by distilling peat tar. MM. Nobel Brothers are developing this industry at Baku; and the anthracene which they extract from naphtha refuse is obtained in a green mass containing from 25 to 35 per cent. of pure anthracene. In order to prove that this crude anthracene is suitable for the production of alizarine, a sample of alizarine oil of good quality was made from it at Ludwigshafen, and was exhibited last year at Moscow. The naphthaline was quite pure; but the benzols, although boiling at between 80° and 85°, contained a great proportion of foreign carburets, and were not suitable for making nitrobenzine. However, it has since been found possible to purify these benzols by lowering the temperature to −14°, which is easily done in Russia. The naphtha residuum of Baku is utilized in making heating and lighting gas, and from this a tar is obtained which is afterward distilled in the same manner as coal tar. Every 1000 kilos. of naphtha residue will yield about 500 cubic meters of gas, 300 kilos. of tar containing 0·6 per cent. of crude anthracene and 17 per cent. of crude benzols boiling at 120°, and giving from 4 to 5 per cent. of benzol and toluol. The house of Nobel Brothers last year had 200,000 tons of petroleum residue to dispose of, and of this only 900 tons were treated by distillation. From this was procured 1500 kilos. of crude anthracene and 15 tons of 80 per cent. benzol. This year the firm expect to make 42 tons of crude anthracene and 500 tons of benzol. Seeing that the European production of alizarine requires from 4000 to 5000 tons of crude anthracene yearly, M. Delahaye opines that it will be long before the competition from the Caucasus will become formidable. The great difficulty at Baku is, moreover, to find capital for establishing factories capable of working up the 250,000 tons of residuum actually disposable.

OXALIC ACID.

OXALIC acid required for the production of oxalate of potash in modern times is always prepared commercially by an ingenious process, which, in brief, consists of the heating together of sawdust and caustic alkali, usually soda and potash combined. The acid is produced in large quantity by the conversion of the vegetable matter, and is afterward separated and purified by a series of processes. Lately, another another means of producing the acid has been invented—this time by a process almost the reverse of the one just described, the vegetable matter being replaced by animal and the alkali by acid. Waste leather from saddlers' or shoemakers' shops, and even woolen rags, horn, hair, etc., have been laid under contribution. These waste materials are heated with one part of sulphuric acid and four of water, and the mass thus obtained is treated, at a temperature of 176° Fahr., with nitric acid one part and water three parts. Oxalic acid is then obtained by digestion of the product.—*Br. Jour. of Photo.*

A NEW method of producing invisible ink, says the *Photo. News*, has been discovered by Herr C. Wiedemann. It is made by mixing together:

Linseed oil	1 part.
Liquor ammonia	20 parts.
Water	100 "

The mixture is well shaken before the pen is dipped into it, as otherwise the little oil which separates causes an oily mark on the paper. To render the writing legible, the paper is dipped into water, the characters again disappearing when the paper dries.

SUTURE-CLAMP COAPTATION.

A NEW METHOD FOR CLOSING WOUNDS.

By J. H. CIPPERLY, M.D., Medical Assistant, Marshall Infirmary, Troy, N. Y.

To the means ordinarily employed in repairing a lacerated or incised wound—bandages, adhesive strips, surgical pins, and the various sutures—another, a new and facile method, is obtained with what I am pleased to call, in the want of a n better term, a suture clamp. Made of hard silver wire, bent at acute angles at both ends, the extremities of the arms sharpened to a point, the instrument is pictured thus:

One hand supports the severed parts together, while the other introduces a clamp, penetrating one lip at a time, and introducing a clamp at regular distances until the coaptation is complete. Their position is retained by the tight grasp of the skin and tissues on the arms of the clamps, supplemented by the inclination of the arms toward each other. A moment's consideration of the advantages of this method: the most striking are the ease and rapidity with which you close the wound. A single instrument is all there is at hand; you do away with needle, wire, needle-forceps, scissors, and the trouble accompanying them. In the closure of the wound there is less constriction to the lips than results in the use of sutures or pins, where the swelling often causes a tearing out; thus is aided the better work of repair. The arms of the clamps sustain both walls, so that the deeper parts of the wound conjoin, and there is less opportunity for the pocketing of blood and pus, and more rapid healing. Again, there is the minimum of pain attending their introduction, and they are removed without pain, and may be used again. Made of various sizes (usually required but three or four), their application is general. With short arms they may be used in scalp wounds and over bony places. In wounds where there is contusion and laceration and gaping, long clamps reaching across will produce a partial union at least, otherwise not attained. The first application was made in the case of an injury where the toes and portions of the metatarsal bones were removed, a buzz-saw accident leaving a single flap from the plantar surface of the foot, and rather short to cover the exposed bones. Five clamps were applied that closed the wound, and were allowed to remain six days, when adhesive plaster was brought into play, as the wound was healing by granulation. In this first instance their ready, time-saving usefulness was at once clearly demonstrated. This occurred in March, 1882, and I have since made use of them repeatedly, and with the uniformity of repeated satisfaction in their success.

Suture-clamp for wounds.

I. Is a new method.
II. Is made of hard silver wire by preference.
III. Has the advantages: 1. Of rapidity in application. 2. Of a single instrument at hand. 3. Of less constriction. 4. Of better coaptation. 5. Of but little pain on introduction and removal. 6. That it may be used again. 7. Of partial union in gaping wounds.
IV. First used in March, 1882.—*The Medical Record.*

DOUBLE IDENTITY AFTER TREPANNING.

By J. N. MCCORMACK, M.D., Bowling Green, Ky., President of the Kentucky State Medical Society, and Member of the State Board of Health of Kentucky.

C. W——, an American farmer, aged twenty-three years, was brought to me in March, 1881, for examination as to his mental condition, that I might testify before a jury, which his friends had requested, as they desired to send him to a lunatic asylum. He was brought from the country in an open wagon by his wife and two friends, and from them was learned the following history: When fifteen years of age, and while engaged as a "striker" in his father's blacksmith shop, he was struck on the head with a pointed hammer and fell to the floor, was unconscious for several hours, gradually recovered, and after a few weeks suffered no noticeable inconvenience from the injury, although a marked depression of the skull remained. This occurred in Allen County. Two or three years later he came to the community in which he now resides, was married when nineteen years of age, purchased a farm shortly afterward, and all this time presented no mental peculiarity which was sufficiently marked to attract attention. Six months before he was brought to me he began to complain of pain and tenderness in the seat of the old wound, and about the same time began to exhibit indications of mental derangement. At first he was morose and sullen, but later became maniacal and difficult to restrain, and for several weeks had had no lucid interval. He had eaten but little, his sleep had been much disturbed, and he had lost strength and flesh rapidly. At the time I saw him he was emaciated and cachectic in appearance, with furred tongue; pulse, 110; temperature, 98°. He was very nervous and impatient of restraint, and presented all the symptoms of acute mania. There was a deep depression, about the size of a silver quarter, at the junction of the sagittal with the coronal suture, and the scalp in the vicinity of the depression was so sensitive that it was examined with great difficulty. The man was evidently in no condition to be sent to an asylum, and was returned to his home, a short distance in the country.

On the following day the operation of trepanning was performed in the presence of Drs. Porter, Murray, Neale, and Meredith. At first a section of bone was removed with a large trephine, and as this did not include all the internal depression, a second section was taken out which slightly lapped into this; still a corner remained, which was removed with bone forceps. The membranes were not injured, and the dura mater appeared healthy. The wound was closed, except at the posterior part, which was left open for drainage. The recovery was rapid, and the relief of the mental derangement was immediate and permanent. He gained strength and flesh rapidly, and in a few weeks appeared to be in perfect health.

Immediately following the operation were developed those curious mental phenomena which gave special interest to the case. The man seemed to be impressed with the idea that he had just recovered from the effects of the blow on the head, and although he talked freely of his history up to the time of the accident, seemed to have no recollection of any event of his life from this time until he was relieved by the operation. He said that he did not know his wife, or that he had a wife; his neighbors were strangers to him, and his business transactions in connection with the purchase of his farm could only be understood after an examination of the deeds and full explanation. He seemed to be entirely ignorant of his former surroundings, and had to learn the roads of his neighborhood like any other stranger. Some of his friends were skeptical in regard to these things, and many tests were made of their truth. His answers were frank and candid, and he always said that he was totally unable to recall anything occurring in this period of his life. When it is remembered that, while a man of fair intelligence, his education was very limited, and that he had never heard of a similar case, it is more difficult to believe that he could manufacture and be consistent in such a story than to believe the story itself. His friends all concurred in saying that there had been a marked change in his general demeanor since the operation. While always industrious and sober, he had been rather boisterous and turbulent in disposition, which was in striking contrast with his quiet manners since the operation. It is to be regretted that the man was not highly intellectual and accustomed to describing his methods of thought, as the interest of the case would be greatly increased by minute mental details.—*Medical Record.*

CORN SILK PHARMACEUTICAL PREPARATIONS.

By GEORGE W. KENNEDY, Ph.G.

DURING the past year several physicians of Schuylkill county have been using different preparations of the stigmata of Zea Mays for catarrh of the bladder and similar diseases with very good results. The preparations should be made from the fresh article, as the dried seems to be worthless, at least that is the experience of those who have had the subject under investigation; cases under treatment which were not benefited by the powder or other preparations made from the dried article, yielded to a tincture prepared from the fresh or green stigmata. It would be advisable to gather the drug before it begins to change in color, or select only that portion having a green or greenish-yellow color. The writer manufactured a quantity of the tincture last September, which has all been prescribed and used by our physicians, and I am now compelled to purchase the fluid extract to supply the demands. One of our medical practitioners, who is very particular, has great confidence in the curative properties of corn silk; his choice of all the preparations is the sirup which I have made and would recommend to be made from the fluid extract. This is an expeditious mode of making the sirup, and one which is entirely satisfactory, the sirup containing only a very small percentage of alcohol. The diseases for which corn silk is recommended are of such a nature—generally of an inflammatory character—that the patient should not use alcohol in any form, because it produces irritation, and irritants should be left out of the preparations as much as possible.

Should the drug prove to be as valuable a remedy as some medical men consider it to be, there is no doubt but its use would become general. Either the fluid extract or the sirup, or both, would be the best preparations to recommend for introduction, although the tincture gave fair satisfaction; yet I do not believe it to be the most suitable preparation.

It should be remembered that the fresh drug contains a large amount of moisture; it contains certainly not less than fifty per cent., and likely considerable more. I would suggest that not less than double the quantity of the drug be used; for example, if a hundred parts of sirup or tincture were to represent twelve parts of the dried material, then twenty-four parts of the fresh or green corn silk should be used. I would recommend the following formulas:

Tincture of Corn Silk.

Take of corn silk, green, twenty-four parts....	24
Diluted alcohol, sufficient to make one hundred parts....	100

Cut the silk into small pieces, either with a large pair of scissors or a tobacco cutter; after which, place in a mortar and beat into a pulp, with a small quantity of the diluted alcohol. Prepare a cylindrical glass percolator, by closing the lower orifice with a cork; transfer the silk pulp to the percolator, and add sufficient of the menstruum to form a layer over the pulp; cover the percolator closely and allow to macerate forty-eight hours; then loosen the cork enough to permit percolation to proceed at the rate of forty drops per minute; add enough diluted alcohol and continue the percolation until one hundred parts are obtained. The tincture possesses the characteristic odor of corn silk, is of a yellow straw color, and of a pleasant, sweetish taste. Dose for an adult, one or two fluid drachms (gm. 4-8).

Fluid Extract of Corn Silk.

Corn silk, green, two hundred grammes	200
Glycerin, twenty grammes....	20
Diluted alcohol, a sufficient quantity to make one hundred centimeters....	100

Cut the silk into small pieces. Mix the glycerin with eighty grammes of diluted alcohol. Place the cut corn silk in a mortar, and beat into a pulp with a portion of the menstruum; after which, pack in a cylindrical glass percolator; add sufficient of the mixture to cover the pulpy mass, and when the liquid commences to drop from the percolator close the lower orifice; cover the percolator tightly, and allow to macerate for forty-eight hours; then permit percolation to go on slowly, about forty drops per minute; add the remainder of the glycerin mixture, and then diluted alcohol until the drug is exhausted, reserving the first seventy cubic centimeters of the percolate; evaporate the remainder to thirty cubic centimeters, and mix with the reserved portion, making in all one hundred cubic centimeters. The odor and taste is similar to that of the tincture, but much stronger, and a shade or two darker. Dose for an adult, from half to one fluid drachm (gm. 2-4.)

Syrup of Corn Silk.

Fluid exract of corn silk, twelve parts....	12
Syrup, eighty-eight parts....	88
To make one hundred parts....	100

Dose, from one to two fluid drachms (gm. 4-8).
Pottsville, Pa., April, 1883.

—*American Journal of Pharmacy.*

A FAVORITE antidote for rattlesnake poison in Mexico, is a strong solution of iodine in potassium iodide. Mr. H. H. Croft has tested some of the poison itself with this solution, and finds that a light brown amorphous precipitate is formed, the insolubility of which explains the beneficial action of the antidote. When iodine cannot be readily obtained, a solution of potassium iodide, to which a few drops of ferric chloride has been added, can, perhaps, be used as an antidote to the poison.

A RECENT ASCENT OF POPOCATEPETL.

CITY OF MEXICO, April 25.—Mexico might well be called the Switzerland of America, on account of the number, size, and accessibility of its mountain peaks. On approaching Vera Cruz the first thing that gladdens the eye of the weary voyager, as he peers over the bow of the steamer in search of land, is the snow-capped peak of Orizaba, apparently suspended in the clouds, and exceeding by nearly 2,000 feet the height of any European peak. The entire horizon of the city of Mexico is filled with mountains. The dominating features of the eastern landscape are the regular, geometrical, snowy cone of Popocatepetl, and just to the north of this the rugged, broken, white crest of Iztaccihuatl. Popocatepetl occupies the second place among the mountains of North America, being 17,720 feet high, about 80 feet lower than Mount St. Elias. Historically it is the oldest of American mountains, as the first recorded ascent was made just thirty years after the discovery of the continent.

When the Spanish invaders were marching through this country, the interest of Cortez was strongly excited by this mountain, then an active volcano, and he sent Diego de Ortaz to ascend it. Ortaz was not successful in reaching the top, but as a reward for his attempt he was allowed to use a flaming mountain in his coat of arms. In 1522 Francisco Mantano, another follower of Cortez, succeeded in reaching the summit and descended into the crater. Since that time the ascent has been made at various times and by various people with increasing frequency to the present day. But although the trip is frequently taken, it is one of the most perplexing experiences to try to get accurate information as to what to expect. The accounts each contain some particular trial, and no two agree. One says you will sink in snow to your neck, another that part of the route passes through a track of black sand that successfully defies all attempts to exclude it; again, that the cold is something portentous. However, in spite of the various troubles that were vividly depicted as lying in wait for us, a party of six left Mexico for the volcano Popocatepetl, on a bright morning in the middle of April. We took the 8 A.M. train for Amecameca, on the Morelos Railroad. As we rolled out of the station on this lovely April morning, nature seemed to have a Fourth of July air. The fields, the roads, and the pastures recalled the New England summer rather than the time of the year shown by the calendar. The scenery was not startling, but quiet and interesting. We first skirted along the side of Lake Texcoco, a most shallow, wandering, rush-grown, and unimpressive body of water. The lake was soon left behind, and we rode along through the valley, with its ever present boundary of distant mountains. The broad fields stretching far away to the right and left were dotted with grazing herds or patches of tilled land in a way to forcibly impress one with the importance of agriculture to this country. We passed through several somnolent towns of adobe huts, and reached Amecameca, a quaint little Mexican settlement, nestling down in the woods under the north-western slope of the volcano. Its population is about 3,000 and intensely Roman Catholic. The town lies about 8,500 feet above the sea level, 1,000 higher than Mexico city. We were provided with letters to the principal man of the town, and he received us with unbounded hospitality. A breakfast was prepared for us, and when we rose from the table everything was in readiness for us to start. The horses, the guides, the pack mule loaded with provisions for the party, were all at the door, so we mounted our horses, bid our genial host good-by, and started for the ranch where we were to pass the night.

For an hour we followed the highway out from Amecameca and then turned into the trail leading up the mountain. It did not lead directly up the side of the volcano, but wound about through woods and fields, along picturesque ravines, down into little gullies, and across mountain brooks, giving us by turns magnificent panoramic views of the valley spread out below us, or of the precipitous sides of the mountains covered with wood growth of the temperate zone hemming us in on three sides. Popocatepetl and Iztaccihuatl stand side by side, and their snow-clad summits surrounded by drifting clouds constantly crowned the mountain view. The ride, though so interesting for us, was a slow and hard one for the horses. They felt the effect of the rarefied air which surrounded us, and in going up the steep mountain pitches which we encountered they soon lost breath and stopped to rest.

We reached the ranch at 5.30 P.M. It lies 13,000 feet above the sea level, just within the timber belt, with the mountain slope rising sharply and regularly behind it to the summit. The quarters were far from palatial. The only buildings were two small wooden sheds or barns; one containing a furnace used in refining sulphur, the other furnishing shelter to the peons, as the working Indians are called, who had charge of the herd of horses grazing on the mountain side. This we were to share with the peons for the night. We dismounted and examined our quarters. The barn was 30 feet long and 20 feet wide. The only floor was a strip about 6½ feet wide, extending across one end of the interior, and this was to serve us for bedstead and mattress. The roof and walls were black with accumulating soot. A large fire was blazing on the ground in the center of the room, the smoke completely filling the building and slowly finding its way into the outer air through the many apertures in the boards, especially at the eastern end, where every other board was missing. A donkey was snugly established in one corner, and there he quietly remained all night. It was dark almost directly. The peons boiled some coffee in an earthen jug at the fire, and from the provisions we had brought we made a frugal supper. Thinking it advisable to get as much rest as possible, we rolled ourselves in our blankets, and, with saddles for pillows, stretched ourselves on the boards. The peons, after chattering among themselves a short time, wrapped their zarapes about them and disposed themselves on the ground around the fire. Silence settled over the company, but sleep did not visit our eyes. We were at such a height that the fire was necessary for comfort, but the smoke, the draughts, the unaccustomed hardness of our sleeping quarters, kept us awake. We, however, each remained quiet, thinking the others might be asleep, until one member of the party, whose blanket proved inadequate to the demands made on it, rolled over with a gruff growl at the idea of shivering in the tropics. Another remarked that everything about him was asleep except his head, and then followed a general comparison of experiences.

I rose and walked out to see what the prospect was for the morrow. The moon and stars were shining brightly. The air was as crisp and as cold as on a November night in New England. Just back of the ranch the huge, smoothly rounded cone of the volcano towered grandly up into the air, its 3,000 feet of snow mantle sparkling in the brilliant moonlight and sharply defining its outline against the dark

midnight sky. Low in the northern horizon was a dense black cloud, illuminated by almost incessant flashes of lightning. No thunder was to be heard, nor were there any other indications of a storm, so I returned to the others with a good report of the prospect.

We succeeded in getting about two hours' sleep apiece, and at 3.30 A.M. we began to make preparations for breakfast. At 5 A.M we mounted our horses and started for the peak. Day was just dawning. In the east a few dashes of red were visible, while in the north the same cloud and lightning were to be seen that I had noticed the previous evening. A picturesque procession we made as in single file we followed along the trail in the dim, cold morning light. We wore broad, Mexican hats, and each had a showy but comfortable blanket wrapped about him in true Mexican fashion. We first rode through a region of stunted pines and then struck the black mountain sand with no vegetation. The light kept growing clearer and clearer; in half an hour it was as light as day, although the sun did not rise until fifteen minutes later. The red in the east became more and more vivid, spreading further into the sky, and was accompanied with a brilliant yellow. The lightning in the north continued until the sun sprang up from behind the peak of Orizaba and day began. The sand through which we were traveling was not very soft, and the slope did not seem steep, but as we zigzagged along the horses panted very hard, and frequently stopped to regain their breath. At 6.15 o'clock we reached a thin coating of snow, and after riding through it for a quarter of an hour the snow-line was reached.

Here we left our horses, blankets, and all unnecessary luggage, and they were taken back to the ranch. The guides bound our feet with coarse cloth to keep the snow from melting on the boots and chilling the feet. They furnished us each with a pointed stick, and we started up the northeastern slope of the cone. There were no precipices nor crevices; it was plain climbing, the slope being quite smooth and regular to the summit, but very steep. The snow was hard and firm, there being but two kinds of surface, one where the snow was perfectly even, the other where it was sharply ridged by the melting action of the sun. The last part of the ascent was wholly through this ridged snow. The ridges were from one and a half to three feet in height, and did not run in the direction up and down the volcano, but followed round the formation of the cone. The tops were covered with ice. They were quite irregular, being broken at intervals, so they offered no important obstacle to climbing. The rarefaction of the air was the only impediment to our rapid progress. Fortunately, none of our party experienced any other ill effect from this cause than the inability to make any continued exertion.

The accounts frequently given by travelers of the direful results attending muscular exertion in high altitudes seemed fictions of the imagination. There was no bleeding at the nose, no feeling of pressure in the head, no giddiness; the glare on the snow was not troublesome, and although we wore only ordinary clothing, the temperature was not cold. But walk for any length of time we could not. After three or four minutes of zigzagging up the snow, the breath seemed to have gone completely out of our bodies. A rest of a few minutes, however, completely restored us, producing a feeling of perfect ease and comfort.

The summit was reached at at 10 A.M., after three and a half hours of hard upward tramping through the snow. The walls of the crater form the summit, there being no mountain formation above it. The crater is about 700 feet in diameter and six hundred feet deep. On the west side, and extending round on the northern and southern sides, the wall is perpendicular and of a reddish rock from which a slight smoke is continually issuing. At the foot of it were three vent holes, about two inches in diameter, from which sulphurous fumes were pouring, and incrustations of sulphur were deposited on the surrounding rocks. On the eastern side the wall is more sloping. The top of the shell of the crater is broken down, forming a broadly rounded surface slanting sharply into the crater. The remainder of the party stretched themselves on the level surface of the snow at the top of this side, but I pushed on into the crater. With a little care in picking my footing I reached a point about half way down, when further descent was suddenly stopped by the side going perpendicularly down the remainder of the distance. I walked along looking for a chance to get lower down, but the smaller stones began rolling down over the edge, and the guide, taking my arm, persisted in leading me back. I had a good view of the floor of the crater, which seemed perfectly flat.

On rejoining my companions I found the cold quite intense; a strong, keen wind was whistling over the mountain top in a way that penetrated to the bone. The clouds that surrounded the summit and went grandly careening past us afforded fine opportunities for the study of cloud-forms, but cut off our view in some directions. Toward Mexico they were piled one above the other in reckless profusion, resembling a vast sea of billowy foam. In the east the sky was clearer and we looked down, as on a raised map, upon the valley extending far into the distance toward Puebla. At 11 A.M. we took a farewell look at the crater of Popocatepetl, and, shivering with cold, began the descent. Our discomfort was soon over, for as soon as we left the summit we were sheltered from the wind, and walking soon warmed us up. Had we been well provided with straw matting we could have slid down the greater part of the slope, but the bits we had were old and soon came to pieces. As there are no dangerous places in the mountain side, we took each our own way of getting down. We all reached the ranch at 1 P.M. We made no stop for rest, but in half an hour had our slight luggage packed, mounted our horses, and started for Amecameca.

Our return route was different from that by which we came, and even more beautiful. It was more direct and more precipitous, abounding in very steep pitches and quick turns. It was almost wholly through a luxuriant forest growth, and the overhanging boughs, the flowering shrubs, the rich tropical vegetation, with the constant background of lofty mountains, made it a ride long to be remembered. We had fine glimpses of the valley lighted by the afternoon sun. It seemed like a world to which we were returning after a pilgrimage to another planet. Many times we turned to look back at the silvery peak of Popocatepetl looming grandly up behind us. Our enjoyment was not now tempered with the mixed feelings of uncertain dread and anxiety which we had felt the day before. The trial was successfully past, and the volcano seemed like an old comrade. At 5 P.M. a travel-stained, sun-burned, weary, but triumphant, company drew up before the door of the hospitable Don F. Ten hours of uninterrupted sleep completely restored us, and we took the early train for Mexico, reaching the city at 10 A.M., after an absence of two days and two hours.—*A. N. B., N. Y. Times.*

SCIENTIFIC EXHIBITIONS.

Magic Cabinets.

THE apparatus by means of which objects of various sizes—a card, a bird, a child, a woman, etc.—may be made to apparently disappear play a large part in the exhibitions of magicians, and also in pantomimes and fairy scenes. Among such apparatus there are some that are based upon ingenious mechanical combinations, while others bring in the aid of optics. We shall examine a few of them.

The Magic Portfolio.—This is an apparatus which an itinerant physicist might have been seen a few years ago exhibiting in the squares and at street corners. His method was to have a spectator draw a card, which he then placed between the four sheets of paper which, folded crossways, formed the flaps of his portfolio. When he opened the latter again a few instants afterward the card had disappeared, or rather had become transformed. Profiting then by the surprise of his spectators, the showman began to offer them his magic portfolio at the price of five sous for the small size and ten for the large.

The portfolio was made of two square pieces of cardboard connected by four strings, these latter being fixed in such a way that when the two pieces of cardboard were open and juxtaposed the external edge of each of them was connected with the inner edge of the other.

This constituted, after a manner, a double hinge that permitted of the portfolio being opened from both sides. To one pair of strings there were glued, back to back, two sheets of paper, which, when folded over, formed the flaps of the portfolio. It was only necessary, then, to open the latter in one direction or the other to render it impossible to open more than one of the two sets of flaps.

This device is one that permits of a large number of tricks being performed, since every object put under one of the sets of flaps will apparently disappear or be converted into something else, at the will of the prestidigitator (Fig. 1).

Magic Envelopes.—This trick is a simplification of the foregoing. The affair consists of several sheets of paper of different colors folded over, one upon the other. A card inclosed within the middle envelope, over which have been folded all the others, is found to have disappeared when the flaps are opened again. The secret of the trick is very simple. One of the inner sheets of paper—the second one, usually—is double, and, when folded, forms two envelopes that are back to back. It is only necessary, then, to open one or the other of these latter to cause the appearance or disappearance or transformation of such objects as have been inclosed within it (Fig. 1.)

Magic Boxes.—Magic boxes are of several styles, according to the size of the objects that one desires to make disappear.

There is no one who has not seen a magician put one or more pigeons into the drawer of one of these boxes, and, after closing it, open it to find that the birds have disappeared. Such boxes contain, as shown in Fig. 1, two drawers, which, when pulled out, seem to be but one; and it is only necessary, then, to pull out the inner one or leave it closed in order to render the inclosed birds visible or invisible.

In order to cause the disappearance of smaller objects, trick performers often employ a jewel box, and, after putting the object (a ring, for example) into this, they hand it to some person and ask him to hold it, requesting him at the same time to wrap it up in several sheets of paper. But this simple motion has permitted the performer to cause the ring to drop into his hand through a small trap opening beneath the box. Yet, while he is doing this, the spectators think that they hear the noise made by the ring striking against the sides of the box. But that is only an illusion; for the noise that is heard proceeds from a small hammer which is hidden within the cover under the escutcheon, and which is rendered immovable when the latter is pressed upon by the performer. The box can thus be shaken without any noise being heard within it, and the spectators are led to believe that the object has disappeared.

Double-bottomed boxes are so well known that it is useless to describe them. Sometimes the double bottom is hidden in the cover, and at others it rests against one of the sides. Such boxes permit of the disappearance or substitution of objects that are not very thick, such as a note, an image, or a card.

Magic Cabinets.—These apparatus were formerly much employed by magicians—Robert Houdin, for instance. The following is an example of one of the scenes that may occur with them:

When the curtain rises, there is seen in the center of the stage a large, dark colored cabinet, ornamented with mouldings, and mounted upon legs that are a little longer than those of ordinary cabinets, the object being to remove all possibility of a communication with the stage beneath. These legs are provided with casters. The showman turns this cabinet around and shows that there is nothing abnormal about it externally. He then asks some of the spectators to come up close to it, and lets them examine its interior, which is entirely empty. There is no double bottom, nor any hiding-place. When the witnesses have made themselves certain of this fact, they station themselves around the stage, and a certain number of them even consent to remain behind the cabinet and see nothing of the experiment. The cabinet being thus surrounded on all sides, and every one being able to look under it, fraud would seem to be an impossibility.

A young woman dressed as a danseuse then comes on to the stage and enters the cabinet (Fig. 2), and the doors are closed upon her. In a few moments the doors are opened again, when, lo and behold! the closet is empty, the young woman having disappeared. Then the doors are closed again, and then opened, and the danseuse makes her appearance; and so on. At the end of the experiment the witnesses examine the cabinet again, and, finding nothing changed therein, are justly stupefied.

In another style of cabinet there is no bar in the center, as shown in Fig. 2, but there is observed on one of the sides in the interior a bracket a few centimeters in length, and, back and above this, a shelf. This arrangement permits of performing a few experiments more than does the one just described. Thus, when the woman has disappeared, the showman allows a young man to enter, and he also disappears, while the young woman is found in his place. This is a very surprising substitution.

The box into which the harlequin takes refuge, and which appears to be empty when Pierrot or Cassandra lifts the curtain that shields its entrance, is also a sort of magic cabinet.

In a series of lectures delivered a few years ago at the

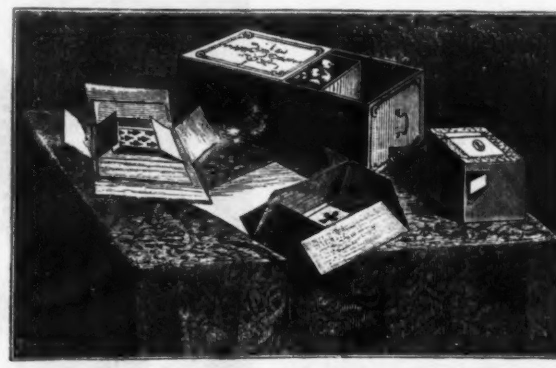


FIG. 1.—MAGIC PORTFOLIO, ENVELOPES, AND BOXES.

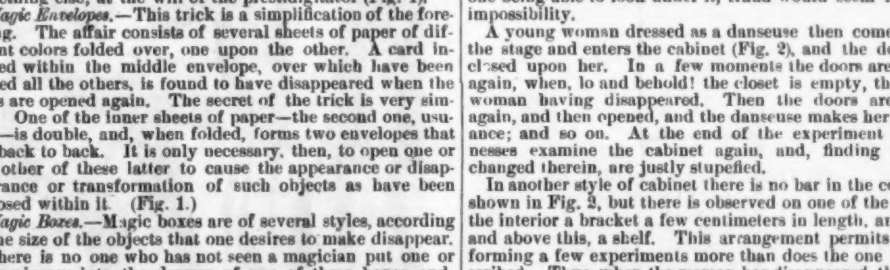


FIG. 2.—MAGIC CABINET.

London Polytechnic Institution, a professor of physics unmasked the secret of some of the tricks employed on the stage for producing illusions, and notably that of the magic cabinet. The lecturer, after showing the cabinet, and causing the disappearance therein of an individual while the doors were closed, repeated the same experiment with the latter open. But, in the latter case, so quick was the disappearance that the spectators could not even then see how it was done.

The illusion produced by these apparatus is the result of a play of mirrors.

In the first cabinet described (Fig. 2), when the exhibitor has closed the doors upon the young woman, the latter pulls toward her two mirrors that are represented in Fig. 3, by the lines, G G. These mirrors are hinged at O O, and, when swung outward, rest by their external edges against the bar,

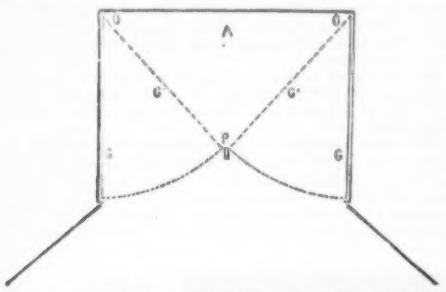


Fig. 3.—PLAN EXPLANATORY OF THE CABINET.

P, and then occupy the position shown by the dotted lines, G' G'. When the cabinet is again opened, the woman placed at A is hidden by the two mirrors; but the appearance of the interior of the cabinet is not changed, since the spectators see the image of each side reflected from the corresponding mirror, and this looks to them like the back of the cabinet.

The illusion is perfect. When the experiment is ended and the mirrors are again swung against the sides, at G G, the spectators see nothing but the backs of them, which are covered with wood; the cabinet is really empty, and no one can discover what modification has taken place in its interior during the disappearance of the woman.

In the second arrangement, which is shown in vertical section in Fig. 4, the young man gets up on to the shelf, *c n*, at the upper part of the cabinet, by the aid of the bracket, T, and then pulls down over him the mirror, *b c*, which was

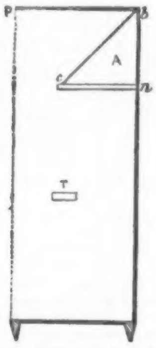


Fig. 4.—SECTION EXPLANATORY OF THE CABINET.

fastened to the top of the cabinet. This mirror, being inclined at an angle of 45 degrees, reflects the top, and the spectators imagine that they see the back of the cabinet over the shelf just as they did before.

The box which Harlequin enters is based upon precisely the same principle. Its interior is hung with paper banded alternately blue and white. When Harlequin enters it, he places himself in one of the angles and pulls toward him two mirrors which hide him completely, and which reflect the opposite side of the box, so that the spectator is led to believe that he sees the back of it. In this case, one of the angles at the back of the box is not apparent, but the colored stripes prevent the spectator from noticing the fact.—*La Nature.*

LARGE SALE OF MISSISSIPPI LANDS.

One of the largest sales of land ever made in Chicago has been consummated by Mr. E. A. Linn, of the real estate and banking house of E. S. Dreyer & Co., the land lying down in "Dixie," and the buyer a foreign syndicate, presumably in "Fatherland," as E. S. Dreyer & Co. are a German house. The cotton belt of the State of Mississippi—be it premised—includes about 4,000,000 acres, lying along the Mississippi River, and of this princely domain the Chicago purchase takes in rather more than one quarter—1,100,000 acres. The remainder of the purchased land—400,000 acres—lies in the great long-leaf pine region in the southern end of the State, traversed by such navigable streams as the Pascagoula and Pearl Rivers, and singularly adapted by its wealth of timber to manufacturing purposes, and by its resinous air, warm from the Gulf breezes, for a health resort. The price paid per acre was $1.35, the total consideration being $1,975,000. This immense purchase is only the first of four such tracts soon to pass into European hands.—*Chicago Inter-Ocean.*

An apparatus meant chiefly for measuring the heat of the blast used in blast furnaces, has been recently patented in Germany by Herr Schoops. It consists of a vessel played upon by the blast, and a Bourdon gauge, which is connected with it by means of a capillary tube, and stands in the room of the man in charge. The vessel is filled with a dry gas (air, nitrogen, or the like), and the gauge tube with a liquid of very small tension, such as glycerine or oil. The pressure in the vessel, corresponding to the temperature of the medium about it, produces changes of form in the tube of the gauge, which are indicated by a pointer in the usual way.

THE NOSE-APE.

The Zoological Garden in Batavia, Island of Java, contains a few very interesting animals; among them a most excellent collection of apes. In this collection there are five orang-outangs, three kinds of gibbons, and many others. As the climate of Batavia is well adapted for keeping apes, and many of the difficulties that present themselves in European countries are not encountered here, it is natural that we should find a large number of apes in this garden, and among them some that have never been brought to Europe, and are but little known here. Among these apes the most interesting is the nose-ape (*Semnopithecus nasicus*). Only stuffed specimens of this species have been brought to Europe, and they were prepared and set in such a faulty manner that they were a mere caricature, and gave an entirely wrong impression of the animal, especially of its peculiar feature, the so-called nose; which is generally curved and bent down in the same manner as the human nose, in order to give the face as much of a human expression as possible. I derived such an impression from the illustrations in Brehm's "Thierleben," and was very much astonished when I first saw a living ape of this kind.

THE NOSE APE.

As is shown in the accompanying illustration, which has been carefully prepared from nature, the nose of the young animal only bears a resemblance to the human nose, for the protruding point resembles a small pug nose, and gives the animal a very comical, impertinent appearance. Nevertheless, the nose is very different from that of human beings, for it is flattened on top, enlarged toward the side, and has a slit in the front part of the side of the base. The real point of the nose has a triangular shape, and forms a very acute angle to the upper lip, and in this part the round nostrils are located, at the top, and very close together. The nose of the full grown animal is entirely different, as can be observed from the beautiful specimen of male ape of this kind in the garden. It has a broad, flat, compact wing or flap of skin or flesh which extends and hangs over the chin, and is contracted and tapered toward the point so as to resemble a short, flat trunk more than a human nose. This trunk covers the mouth and lower jaw, if the animal is viewed from the front, and gives the entire face a very pointed appearance. The large, narrow nostrils are on the lower sides of the trunk, and are only visible during certain movements of the animal, especially when it gapes, which occurs very often. The entire trunk is then thrown upward and folded back so that the uncommonly strong teeth become visible. Otherwise the trunk is not capable of much movement, excepting when the animal jumps about, for then the trunk swings to and fro.

The naked face of this full-grown ape is of a yellowish brown flesh color, and is very smooth, only the upper lip being provided with a few short, dark, bristly hairs where the trunk begins. There are a few similar short hairs above the eyes. The latter are small, set far back, have a very bright, light-brown iris, and have an expression of cunning which contrasts very oddly with the otherwise somber appearance of the face. The hair is stiff, very thick, and quite long on the cheeks, forming whiskers which almost cover the naked black ears, and on the sides of the neck they form a wide-projecting collar, which is closed by the short, thin whiskers. Along the upper arm, the belly-line, and back, the hair forms sharp seams, which appear very distinctly, as they are of a different color from the rest of the hair. This gives the animal a very peculiar appearance, and makes it seem as if it was dressed in livery. The short, thick hair of the head forms a skull-cap, which sometimes completely covers the eyes. The hair is of a very light, reddish brown color, which gradually becomes paler toward the back, and finally changes to a russet gray; that is to say, the single gray hairs have russet-colored points. The base of the tail is bordered by a square white field, and the tail, which is well covered with hair, is quite white, as are also the upper sides of the hands and feet. The toes of all the extremities are very strong and hairy, and are provided with narrow, long, black, somewhat curved nails, of which those on the second toes of the back feet are longer than the rest. The soles of the feet are black. The above described specimen is a full-grown male, which, when standing erect, is more than three and one-half feet high; but it is claimed that the animals grow larger than this.

As the illustration shows, the young ape is totally different from the full-grown ape. The face is wrinkled, which gives the animal the appearance of a youthful old man; the eye is very large and of a bright, yellowish brown; the upper part of the body is of a reddish color; the lower parts of the legs and the lower part of the body are of a yellowish tint, which appears especially marked at the belly; the square field at the base of the tail is ashy gray, as well as the tail itself; and the cheeks are light russet color, and are provided with such short hairs that the oval, naked ears are visible. The young nose-apes of the Zoological Garden of Batavia are very lively; they are very nearly without fear, and are continually begging the visitors for something to

eat; but they do not make such unpleasant grimaces as other apes do. They have great respect for their seniors, and a glance is sufficient to drive them to the corner of the cage.

The full-grown nose-ape generally remains quietly in one place, and does not seem to think the visitors worthy of any attention, but casts a cunning glance at them occasionally. It does not take food or dainties from the visitors, but the young apes jump for them immediately. Even the meal-time, which is awaited with anxiety by most apes, does not affect the stoical rest of the old gentleman. He generally devours a few leaves of the salad and leaves the rest of the food, consisting of bananas and boiled rice, to his younger companions. I have been informed that the best food for an ape of this kind consists of raw potatoes. If the nose-apes in the Zoological Garden of Batavia keep very quiet, the cause of this can probably be found in their captivity, for I do not doubt that the animals are much more lively when at liberty. I have been told that the nose-apes are the most good-natured and kind of all apes while in captivity. A full-grown ape, which was caught only two days before, permitted itself to be guided by means of a thin rope, and sat down with the sailors in the boat as if he had been with them for weeks. All captured nose-apes become tame very soon, and accustom themselves to the house so well that they can be permitted to run about freely. The reason why these apes have never been brought to European zoological gardens is probably that the method of treating and feeding them is not well known; but I think that if the proper care is taken they can be kept in our gardens as well as in Java.

The home of the nose ape is in Borneo, but of its life very little is known. Several persons who have lived in Borneo for some time state that he lives in small groups in the forest along the coast, and is very shy. The Dajakas hunt the animal for its beautiful fur, and also catch it alive. No doubt they are well acquainted with the history and peculiarities of the animal, but no one seems to have taken enough interest in the matter to make the necessary inquiries, and to study these peculiarities.—*Dr. O. Finsch, in the Gartenlaube.*

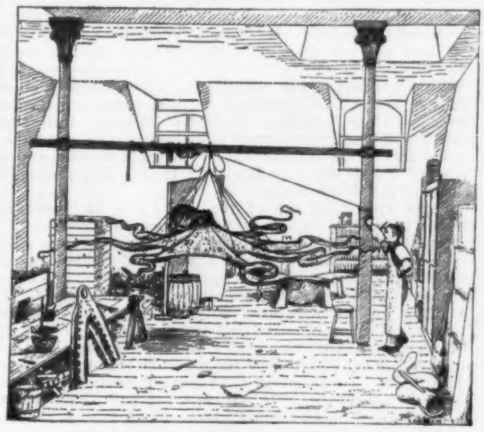
[SCIENCE.]

MODEL OF THE GIANT OCTOPUS OF THE WEST COAST OF AMERICA.

WHILE working on the models of the large Newfoundland squid (Architeuthis princeps) for the Yale and Harvard museums, it was proposed that I should also model the large octopus of the west coast of America. Nothing was done upon it, however, until the past winter, while preparations were making by the U. S. Fish Commission for the International Fishery Exhibition in London. For this exhibition, Mr. William Palmer, one of the modelers of the National Museum in Washington, was sent to New Haven to make a copy of the Architeuthis model; and, while this was in progress, plans for the octopus were often discussed, and finally arrangements were made for him to remain in New Haven, to assist in making an octopus model and a paper cast for the Fishery Exhibition.

As neither of us had seen the animal alive, nor could make a trip to California for the purpose, the model had to be copied chiefly from specimens preserved in alcohol, and restored according to the best information we could get as to its appearance when living. The largest specimens we could get were badly shrunken by the alcohol; and one of moderate size, with arms about three feet long, was selected; the thickest part of the arms. The ends of the arms are curved irregularly, as they might be in an animal just starting to crawl.

The highest point of the body is twenty-two inches above the lowest suckers. The arms spread over a circle eighteen feet in diameter, and the conneting membrane between the lateral arms extends three feet from the mouth. The longest arms, those of the second pair, are made as long as the largest measurements from life (sixteen feet); and the shortest, the fourth pair, thirteen feet. The third arm on the right side is shorter than the others, and hectocotylized in the male, and is so made in the model. All the arms are four inches in diameter at the thickest part. The body is made proportionally smaller than in small specimens. The warts on the head are copied from one of the largest specimens examined, the others showing only two pairs over the eyes. The membranes between the arms have been made much as they are in alcohol, but somewhat wider and more distinct along the sides of the arms. The largest suckers are two and a quarter



MODEL OF THE GIANT OCTOPUS.

inches in diameter, and decrease in size from the thickest part of the arm toward the tip and toward the mouth.

For convenience in making and moving the model, the arms are made removable at a distance of three feet from the mouth, just beyond the edge of the widest membrane.

The upper side of the middle part of the model, including the head and body, was modeled in clay and a mould made from it in plaster. This was then turned over, and the mouth and under sides of the bases of the arms modeled in it. The arms are so much alike that it was only necessary to model the bases of two of them—one right and one left; and from these a plaster mould was taken in which the casts of the bases of all the arms were made. This mould stands against the table at the left in the engraving. The ends of the arms were modeled in a similar way, the back being first finished, and a plaster mould made, which was turned over, and the under side modeled upon it. For modeling the tops of the suckers, a set of stamps was made. A set of suckers of the desired sizes was modeled in clay on a turntable, and plaster casts made of the tops of them, and these used to stamp the tops of the rest of the suckers, which were trimmed round with a knife, and attached to the arm with soft clay, after which the narrow membranes connecting the larger suckers were modeled between them

When the moulds were dry, the paper casts were made in them by methods which had been used by Mr. Palmer for models of large fishes and cetacea. The mould having been greased, paper soaked with paste was laid in it, and pressed and rubbed with the hands until it fitted close to the surface of the mould, and the edges of the pieces of paper adhered together. When the first layer of paper was nearly dry, another was pasted over it; and, if the strength of the model required it, other layers were added. The thin membranes between the arms were strengthened by wire netting between the two layers of paper, the meshes being filled with whiting mixed with glue. On the surfaces of the suckers, paper pulp was put in the mould before the paper was pasted in.

After drying several days, the casts were taken from the moulds, the edges trimmed, and the pieces fastened together with glue. The broken places in the casts were mended with paper pulp, the joints covered over with the same material, and, when dry, the surface was smoothed with sandpaper, and varnished with shellac. The siphon was made separately, and afterward attached to the body. The mouth was made of plaster, showing the jaws closed. The eyes are of glass, like ordinary birds' eyes, painted and silvered according to the best evidence we could get as to their color.

The color of Octopus punctatus seems to differ greatly, according to its moods and surroundings. It is commonly described as light orange or yellow with reddish brown spots. At other times it appears to be bright orange and crimson, with dark-brown blotches on the back. The model was first painted light gray, on which the other colors were thrown from a brush in fine spots. The orange spots are scattered over the whole surface, and more thickly in patches along the back and sides of the arms. Crimson spots are distributed in the same way; and over both, dark-brown spots are thinly scattered. The faces of the suckers are yellowish white without spots.

The model weighs about seventy pounds, and is stiff and strong enough for ordinary handling, and only likely to be broken by a fall or sudden blow. It is intended to be hung in a horizontal position, as in the engraving, but high enough for the under side to be seen, as well as the upper. It hangs by eight wires attached to rings near the joints in the arms, and connected together above so that it can be hung from a single hook.

The engraving shows the model hanging in the workshop at the Yale Museum. The pillars between which it hangs are fourteen feet high. On the floor, in the back part of the room, is the mould of the body, and bases of the arms. At the left, against the table, is the mould for the under sides of the bases of the arms, and at the right, on the floor, one of the arm-moulds, with the two parts fitted together.

J. H. EMERTON.

and from this most of the details of the model were enlarged four times.

The original description of Octopus punctatus, by Gabb, in the Proceedings of the California Academy of Sciences for 1862, is from a small specimen preserved in alcohol, and so was of little use; and there appears to have been no good description published since, though there have been numerous notices of the capture of specimens of large size.

On all anatomical points we depended chiefly on Professor Verrill's knowledge of the cephalopods. In the color, size, and position of the body, we were aided by descriptions and sketches by Messrs. W. H. Dall and A. Agassiz, who had seen it alive. I was also guided by my knowledge of Octopus bairdii, the small species of the east coast, which I had several times seen alive.

The position of the middle part of the body is that often taken by Octopus bairdii when resting on the bottom after swimming, with the head raised, and the body supported on

THE GENUS PHENACODUS.

THIS genus has been referred to in this journal at various times as an important one in the phylogeny of the ungulata. I give now a figure of the best preserved specimen of the genus, with the bones in place, as they were found by Mr. Wortman. The species is the *P. primævus*, Cope. The specimen, as it lay in the sandstone of the Wasatch formation, was divided by a gutter which scattered the posterior dorsal and lumbar vertebræ. These were all found, with one exception, and arranged in place. The head was also found separate a few inches distant. There are probably nine species of Phenacodus known. The largest of these is the *P. nunienus;* next is the *P. primævus;* and then follow in order of size, *P. puercensis, P. vortmani, P. macropternus, P. brachypternus, P. calceolatus, P. zuniensis.* The last two and the *P. puercensis* are from the Puerco epoch, the others are from the Wasatch.

The measurements show that the *P. primævus* was as large as a big-horn; that its body was rather longer than in that animal, and its legs shorter and more robust. It was, in fact, proportioned more as in the common American tapir, but was of smaller size. The middle three toes of both feet reached the ground, while the first and fifth projected laterally and posteriorly, like the dew-claws of the hogs. The

PHENACODUS PRIMÆVUS, COPE. (One-fourth natural size.)

tail was longer and heavier than that of any of the living hoofed animals, resembling in its proportions that of the wolf. The eyes were small and the muzzle long, but was singularly soft above. Whether this soft part was pierced by valvular nostrils, as in the hippopotamus, or was produced into a short proboscis, as in the saiga or in the tapir, cannot be certainly ascertained, but there are indications of the insertion of important cartilages, if not muscles, on the superior faces of the premaxillary bones.

The animal was probably omnivorous in its diet. It was not furnished with any weapons of offense or defense pertaining to the osseous system, so that it must have sought refuge in flight. The well-developed muscular insertions of its limbs and the digitigrade character of its step indicate that it may have had considerable speed.

The bones of this species have been found wherever the beds of the Wasatch epoch occur, but most abundantly in Northern Wyoming. From the Wind River Valley Mr.

Wortman brought two specimens, and ten from the Big-Horn Basin. One of the latter is now figured.

In a future number of the *Naturalist* I hope to give a similar figure of the *P. vortmani*, of which a nearly equally complete specimen has been found.—*E. D. Cope, American Naturalist.*

THE NEW METAL—ZIRCON.

G. A. KONIG has described and analyzed zircon from two occurrences of the Pike's Peak district, in one case the mineral being associated with astrophyllite, and in the other with Amazon stone. In one of the instances we have to describe, the zircon is intergrown with large crystals of flesh-colored microline in one of the localities above mentioned, and is thus analogous to the latter occurrence noticed by Konig. There were many loose crystals in this cavity, but a few were found penetrating or embedded in the microline. The crystals described by Konig showed both pyramid and prism, but the prism is entirely lacking on all of our specimens. Some crystals are more than an inch in diameter, and these large ones especially are often mere aggregates of numerous small pyramids grown together with a common crystallographic orientation. The lateral edges of such crystals are often continuous, but the terminations are made up of many small pyramids. Although the pyramid is the only prominent form, one can notice, on looking at the terminations in the right position, a minute reflecting surface on each perfect apex. A closer examination with the loupe shows it to correspond to the basis, but all observed surfaces are too small to admit of certain determination.

Near the Pike's Peak toll road, about due west from Cheyenne Mountain, a prospect tunnel, in following a vein-like mass of white quartz in granite, has disclosed a number of interesting minerals. The main body of the quartz is pure white in color and contains only traces of galena and chalcopyrite. Within this body, however, is a second smaller vein, consisting likewise chiefly of white quartz, but carrying in it a number of other minerals, the most abundant of them being zircon. The boundary between the two masses of quartz is sharply drawn, but the development of the tunnel is not extensive enough to show clearly the relation of the two bodies.

Throughout the greater part of the vein the zircon is embedded directly in the quartz, and is so abundant that a cubic inch of the latter mineral contains from 25 to 100 crystals and particles of zircon, varying in size one centimeter downward. In parts of the vein, however, are small, irregular spaces filled with a soft, yellow foliate mineral in which are embedded very perfect crystals of zircon. Fluor ite and a white foliate mineral are sometimes associated with the others. The two foliate minerals are as yet undetermined.

This occurrence is worthy of special notice on account of the perfection of the crystals and their transparency. Some of the crystals lying in the quartz are perfectly developed, but usually their growth has been more or less hemmed by the quartz, and many are fissured. The crystals embedded in the soft, yellow material, however, are often absolutely perfect in form, and beautifully clear. The ruling color is a deep reddish brown with variations toward pink or pale honey yellow. A few crystals are of a deep emerald green, and spots of the same were noticed in some of the pink crystals.

The chemical investigation of this zircon shows it to be exceedingly pure, and the specific gravity of the transparent crystals is 4·709 at 21° C. The perfection of the crystals, with their transparency and color, make this occurrence of zircon one of the most beautiful known.—*American Journal of Science.*

THE MINES OF OLD MEXICO.

PACHUCA, Real del Monte, El Chico, and Santa Rosa, in the State of Hidalgo, are among the richest mining districts in the republic of Mexico. Pachuca is the capital of the State, and lies fifty-seven miles north of the city of Mexico. The journey can be easily made by means of the Vera Cruz Railroad, with which Pachuca is connected by a tramway. As the tramway approaches Pachuca the mountains seem to draw near, one of them having on its summit a stone formation which, in the distance, bears a striking resemblance to a huge cathedral with domes and towers. It is in the region of this grand cathedral that some of the richest ores are found.

It is obvious the advantage of this region over other districts in Mexico, being thus easily connected with the great capital and having easy access to the coast. That miners have availed themselves of this advantage is shown by the list of mines: Pachuca works 154, Real del Monte 76, El Chico 24, Santa Rosa 13—a total of 267. The powerful Real de Monte Mining Company works 77 of these. Real del Monte lies to the northeast of Pachuca, El Chico to the north, and Santa Rosa to the northwest.

From the time of the conquest up to the present date it is estimated that these four districts have yielded $1,000,000,000 out of $4,000,000,000, the total amount extracted from the mines of Mexico. The Aztecs, before the conquest, sought silver in those regions, and after the subjugation innumerable Spanish miners dug holes in the mountains, extracting what ore they could before their works were obstructed by water, when they abandoned them to dig other holes. The silver was obtained by smelting by the early miners, but it was in 1557 a Spaniard named Bartholome de Medina discovered, in Pachuca, the process of amalgamation with mercury. His discovery is the basis of the "patio" process, which is the system most in use in Mexico, having been found so far the cheapest and possibly the best adapted to the country.

The ore when brought from the mine is cracked into small pieces and assorted according to its richness by hands employed for the purpose; it is then put in sacks and carried by mules to an "hacienda de beneficio." Here it is ground to a fine powder by being crushed between huge revolving stones, turned by horse power. These grinding stones are called "arrastres." When the ore is sufficiently fine, it is mixed with mercury and salt by means of mules tramping through it an average period of ten days. The mass is then washed, the refuse passing off with the water, the amalgam sinking to the bottom. This washing is done in Pachuca by men who steady themselves with ropes hanging from the roof of a shed and walk backward and forward in the "toria." As the water is allowed to pass off it runs through a narrow channel, the bottom of which is laid in ridges. In this channel little boys shuffle their feet about, detaining in the ridges any portions of metal that may pass off. The boys earn twenty-five cents a day for this work. For the most part these workers looked chilled and unhealthy, splashing around in the muddy water. In Guanajuato the washing is done by means of hugh stones revolved in the water. When the water passes entirely off from the works, the natives often obtain from it large quantities of silver. Many of them are at this work all day in the waste water as it leaves the "beneficio." The process of separating the silver from the mercury is simple and well known. In Pachuca there are seven reduction works, most of them on this system. There is but one "pan" mill so far established. Foreigners are at present trying to introduce improved methods and machinery. This, when accomplished, will be of great service, as ores not yielding more than $30 a ton are not considered worth working by the present process. Great quantities of these depreciated ores lie outside the mines waiting for some less expensive method. Miners not owning their own works can have their metal reduced at the "beneficios" at $20 or $22 a ton, with a charge added for the loss of mercury, which is about ten per cent. of the quantity used.

The immense wealth of there regions was proved by one Pedro Jose Bornero de Terreros, a Spaniard, in 1739. He, having acquired a fortune in Queretaro, started for his native Spain, but on his way he stopped to look into the mines of this region. He became so much interested that he soon put into them his entire fortune. In this he was assisted by Bustamente, a friend who joined his enterprise. When their capital was exhausted, nothing daunted, Bustamente returned to Queretaro to raise funds, and Terreros went for a like purpose to the city of Mexico. Bustamente failed, but Terreros returned to his mines to be reimbursed, when finally he brought out of them $11,000,000, and the title of Conde de Stc. Maria de Regia—Regia being the name of one of his mines.

Santa Gertrudis, one of the mines now in "bonanza," has within the last four years given a gross yield of $4,000,000. It is as yet only worked 160 yards deep. More than $2,000,000 has been paid over to shareholders in dividends or used for improvements in the mine. It has an engine of 50 horse power, for which was paid $75,000. The hoisting apparatus is often moved in these mines by horse power. The machine is called a "malacate." In the region of Santa Gertrudis, San Pedro, Rosaria, Guatomotzin, etc., ores vary from $20 to $300 per ton, even running as high as $500. The ores found in the region of Santa Rosa contain quite a percentage of gold; selected ores have essayed $15.20 gold, $103.50 silver by ton. From Cueva Santa selected ore has assayed up to $350 per ton of silver.

Pachuca has a population of 25,000, which is increasing rapidly by the incoming of miners, drawn thither by mines in bonanza. A considerable part of the population is made up of Cornishmen, who are for the most part the skilled laborers in the mines. They make $3 per head a day, while Mexican skilled labor can only claim $1 a day, and common labor thirty-seven and a half cents. The miner working at $1 a day is entitled to one-eighth of the ore he obtains. Owing to this, he loses no time, and bends all his energies to make his eighth as large as possible. A man is only employed twenty-four hours a week, in order that all may have a chance at work. This, however, may be the case only in some of the mines. The Real del Monte Mining Company pays as much as $30,000 a week to miners, and it is estimated that as much as $75,000 is paid out by the four mining districts together.

Of all objects of interest in Pachuca and its vicinity there is nothing so beautiful as the road from Pachuca to El Chico. A narrow bridle-path runs over the mountains fifteen miles. The mountains themselves, from their very height, lend a grandeur to the scene. For some distance they are crowned with huge perpendicular rocks, which are called the "Frailes," perhaps because they look so stern and grave. One points a great stone finger up to heaven. At one spot is passed a great rock projecting from the mountain-side, under which twenty persons could find a shelter if not made nervous by its curious poise; but this and other great bowlders that the stone monks have rolled down from above, seem to have stopped a moment (grown into centuries) in their downward course. Another mountain with a rocky crown has on its summit a huge stone eye to which the heavens give a blue pupil. Still another bears on its crest a solitary tree for which the birds of the air must have sown a seed long years ago. At the most beautiful point in the road two huge moss covered bowlders meet in a bend, and above them two others. Over these mossy steps, from opposite directions two laughing streams come dancing; they take the fall together, and dash down the ravine, jumping moss grown trees that fall across the way, and curving great round rocks incased in moss and dotted with anemones. The trees around have a hidden ambition for ship masts, or great beams in the mines, they stand so tall and straight, holding their heads high even on the edge of a ravine, never deigning to stoop forward or bend in their dignity. Here and there a red cross is thrown out against the green, marking the kilometers of the way, and redeeming the pass from a devil's haunt. This region is so high it never knows the drouth and parched aspect of the dusty dry season; it is always an emerald, one of Mexico's jewels without price.

The road from Santa Rosa to El Chico is rugged and picturesque, but lacks the verdant freshness of that of El Chico. It was on this road that we travelers sought shelter in a "palqueria," "El Angel." It was rather surprising to find ourselves sitting on "The Angel's" bar. It is wonderful with what rapidity the rain creates mountain torrents. An hour will serve to convert a pebbly path over which one has walked, into a hoarse, raging stream, defying a passage. On this occasion El Chico, as the clouds lifted, was as pretty as a picture. It differs from other Mexican villages in having peaked thatched roofs, and with its pointed caps nestled against the mountain, is unusually attractive to the traveler's eye. In every direction when crossing the mountains can be seen the tall red chimneys of the mines.—*Cor. Globe Democrat.*

ENGLISH AND AMERICAN ADVERTISING.

THE *Ironmonger* (London), contrasting the difference between the Englishman's and American's mode of doing business, concludes that there are not a great many points in commercial or trade matters as to which the average British manufacturer would be willing to admit the decided superiority of American concerns. But in a few respects the manufacturers of the United States are cheerfully admitted to be abreast of the best practice we can show in the same lines, and in two or three items our cousins across the Atlantic are undoubtedly moving ahead. In one department only do we on this side concede the unmistakable and pronounced superiority of the gentlemen on the other side of the water. That department is advertising, which, in the United States, has been developed and systematized to an extent almost unknown with us. There are individual advertisers in this country, it is true, whose expenditure is greater than that of any American house, yet, taken as a whole, the art of advertising is more cultivated and more successfully studied in the States than in this country. The American people are thorough believers in the efficiency and necessity of advertising, and their practice fully and completely vindicates all the theories they enunciate on the subject. They look upon suitable annoucements of this class as being indispensable, and no business is started or continued without a liberal allowance for advertising expenses. Neither their modesty nor their experience ever limits this expenditure, which they know to be productive of the best results when properly and systematically regulated. Advertising on a bold scale is looked upon as a *necessity* in the States, whereas not a few British firms believe they confer a favor on the journals they patronize, if they advertise at all. Besides that, there are houses in this country who actually urge that it is "undignified" for them to insert an advertisement. They have reputations of old standing, and they think that to advertise even in a journal of the highest *status* is decidedly *infra dig.* The consequence is that the newer generation of buyers overlook these giants of former days, and gradually form other connections and associations, so that when the "reputation" is exhausted its high-minded owner's businesses expire in a dignified but decided state of dry rot. On the other side of the ocean age has not yet brought about these indications of senility, nor are there any present symptoms of such a consummation. The Americans are a vigorous and "live" race, in fact, and they know that to maintain their almost unparalleled rate of progress they *must* advertise. They know that to steadily keep themselves before the public or the trade is the only sure method of insuring plenty of work and a constantly growing circle of customers.

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